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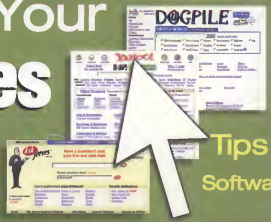

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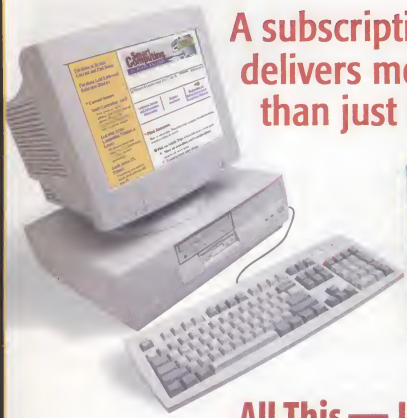

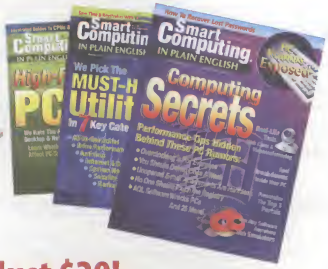

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Smart Computing Guide Series
Vol. 9 Issue 1

6 Hardware Less Than $100

07 **Go Mobile For Less Than $100**
Cheap Options To Enhance Your Life On The Go

10 **Inexpensive Peripherals**
Outfit Your Computer For Under $100

16 **Affordable Gadgets & Accessories**
These Tools May Not Be Necessary, But They Make Computing More Fun

19 **Canon BJC-3000 Color Bubble Jet Printer**
Casio Cassiopeia EM-500

20 **HP Pavilion 8760C**

21 **Intel Pocket PC Camera**
Sony CLIE PEG-S300

22 **WinBook Si2 750**

23 **UMAX AstraNET e3420**
Samsung ML-4500

24 **S3 Diamond Multimedia Viper II**
IBM Infoprint 21

25 **Olympus D-490 Zoom**
Micro Solutions backpack cd-rewriter 192100

26 **Microsoft Trackball Optical**
Palm m100

27 **NEC Versa VXi 600**

28 **Wacom Graphire**
Intel Easy PC Camera

29 **Maxtor DiamondMax VL 40 40.9GB**
Lexmark Optra E312

30 **IBM NetVista All-In-One X40i**

31 **Xerox DocuPrint M760**
Seagate Cheetah 36LP ST336704LWV 36.7GB

32 **Kodak DC4800**
Voyetra Santa Cruz

33 **Philips Vesta Fun PCVC665K**
HP ScanJet 5370Cse

34 **NEC SuperScript 1450N**
VTech Phusion

35 **Toshiba Satellite 2775XDVD**

36 **Canon BJC-2100 Color Bubble Jet Printer**
Minolta Dimage 2300

37 **Hewlett-Packard PhotoSmart 1218**
Olympus Camedia P-400

38 **Gateway Solo 1150cl**

39 **MAG InnoVision 810FD**
Motorola Talkabout T900

40 **Radeon 32MB DDR Graphics Card**
T54H 15.1-inch TFT LCD Monitor

41 **IBM P96**
Matrox Millennium G450

42 **Toshiba Satellite 1675CDS**

43 **Hercules 3D Prophet II GTS**
HP PhotoSmart 618

44 **WinBook Si 800**

45 **Xerox WorkCentre XD125f**
iREZ KritterUSB

46 **HP ScanJet 4300Cse**
Kodak DC5000

47 **IBM InfoPrint 12**
Apollo P-2150U

48 **HP OmniBook 900**

49 **White Paper: EIDE vs. SCSI**
Performance & Price Determine How Much You Need Speed

55 A Closer Look At Linux, The Operating System That Could

56 **User, Meet Linux**
Get To Know The Other Operating System

60 **The Language Of Linux**
Learn How To Talk The Talk

63 **Your Linux**
Find The Distribution Flavor That's Right For You

66 **Linux Hardware**
The Platforms That Make Linux Tick

68 **Preparing Your PC For Linux**
The OS Scales Well, But You May Need To Upgrade Components

70 **Upgrading Issues**
Answers To Common Installation Questions

74 **The Calm Before The Storm**
Preparation Is The Key Element Of Installing Red Hat 7.0

76 **Installing Red Hat Linux 7.0**
Take These Steps To A New OS

80 **Getting Around In Linux**
A Look At Two Graphical User Interfaces

82 **Customize Your Linux Desktop**
The Terminal Window & Graphical Interface Offer All The Power You Need

84 **The Linux Network**
Sharing A Dial-Up Connection To The Internet

88 **Troubleshoot Your Linux System**
Expert Advice To Help Solve Your Problems

92 **Top Tools**
What You Need To Work & Play On Your Linux System

96 **Linux Online**
Get The Help & Information You Need From These Online Resources

100 **The Future Of Linux**
Three Markets Hold The Key To Tomorrow

Web Only

GO.com
A Portal With Search Power

The Future Of Your Search
Tomorrow's Tools To Focus On Quality, Not Quantity

GoTo
Pay-For-Placement System Works Better For Some

102 Tips For Effectively Searching The Web

103 **A Method To The Madness**
Understanding The Web's Organization Makes It Easier To Find What You Want

108 **Search The Web With The Top Four Browsers**
Tips For Getting The Most From Each Search

111 **The Main Search Engines**
All The Portals That You Can't Leave Behind

114 **Specialized Search Engines**
Delve Deeper Into The Web

118 **Souped-Up Searches**
Find What You Need Faster

122 **Yahoo!**
Use This Web Directory To Energize Your Search

123 **MSN Search**
Microsoft's Engines Drive A Powerful Search Tool

124 **Netscape Search**
Navigate Your Way Through The Web

125 **Excite Search**
Lively Results From An Old Pro

126 **AltaVista**
Put This Engine To Work For You

127 **Raging Search**
This Search Engine Is All The Rage

127 **Ask Jeeves**
Straight From The Butler To You

128 **Google**
You'll Go Gaga Over This Engine's Speed

129 **America Online**
A Wealth Of Information For Nonmembers, Too

130 **Web-Search Software**
Powerful Programs Simplify The Information Hunt

132 **Get Your Site Noticed**
Let Search Engines & Web Directories Help Surfers Find You

134 **Create A Higher Profile**
Boost Your Site's Place In Search Engine Rankings

136 **Learn To Use Meta Tags On Your Site**
Give Search Engines Something To Look For

138 **Build A Search Function Into Your Web Site**
Help Users Find What They Want So They'll Come Back For More

142 **Index**

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January Focus:

Hardware Less Than $100

Many users often associate the word "hardware" with "expensive." We'd like to disprove that association in this issue. Many great deals aren't here today and gone tomorrow. You can find excellent deals if you just know what to look for.

Deals can be had in many areas: PDAs, digital audio players and recorders, Web cams, printers, scanners, and much more. The first three stories in this issue will show you the righteous path to great prices.

7 **Go Mobile For Less Than $100**
Cheap Options To Enhance Your Life On The Go

10 **Inexpensive Peripherals**
Outfit Your Computer For Under $100

16 **Affordable Gadgets & Accessories**
These Tools May Not Be Necessary, But They Make Computing More Fun

49 **White Paper: EIDE vs. SCSI**
Performance & Price Determine How Much You Need Speed

Cameras
43 HP PhotoSmart 618
28 Intel Easy PC Camera
21 Intel Pocket PC Camera
45 iREZ KritterUSB
32 Kodak DC4800
46 Kodak DC5000
36 Minolta Dimage 2300
25 Olympus D-490 Zoom
33 Philips Vesta Fun PCVC665K

Desktops
20 HP Pavilion 8760C
30 IBM NetVista All-In-One X40i

Input Devices
46 HP ScanJet 4300Cse Scanner
33 HP ScanJet 5370Cse Scanner
26 Microsoft Trackball Optical
23 UMAX AstraNET e3420 Scanner
28 Wacom Graphire Tablet

Notebooks
38 Gateway Solo 1150ci
48 HP OmniBook 900
27 NEC Versa VXi 600
42 Toshiba Satellite 1675CDS
36 Toshiba Satellite 2775XDVD
44 WinBook Si 800
22 WinBook Si2 750

PDA/Handhelds
19 Casio Cassiopeia EM-500
26 Palm m100
21 Sony CLIE PEG-S300
34 VTech Phusion

Printers
47 Apollo P-2150U
36 Canon BJC-2100 Color Bubble Jet Printer
19 Canon BJC-3000 Color Bubble Jet Printer
37 Hewlett-Packard PhotoSmart 1218
47 IBM InfoPrint 12
24 IBM Infoprint 21
29 Lexmark Optra E312
34 NEC SuperScript 1450N
37 Olympus Camedia P-400
23 Samsung ML-4500
31 Xerox DocuPrint M760

Sound & Vision
43 Hercules 3D Prophet II GTS Video Card
41 IBM P96 Monitor
39 MAG InnoVision 810FD Monitor
41 Matrox Millennium G450
40 Radeon 32MB DDR Graphics Card
24 S3 Diamond Multimedia Viper II
40 T54H 15.1-inch TFT LCD
32 Voyetra Santa Cruz Sound Card

Storage
29 Maxtor DiamondMax VL 40 40.9GB
25 Micro Solutions backpack cd-rewriter 192100
31 Seagate Cheetah 36LP ST336704LWV 36.7GB

Miscellaneous
39 Motorola Talkabout T900
45 Xerox WorkCentre XD125f

Go Mobile For Less Than $100

Cheap Options To Enhance Your Life On The Go

No one disputes that technology has become an indispensable part of our lives; whether it's affordable or not, especially when you want to travel, is another matter. When we usually think about mobile computing gear, notebooks, PDAs (personal digital assistants), digital cameras, and other pricey items spring to mind. But it doesn't have to be that way, because a plethora of products exist for less than $100 that can keep you productive and entertained while away from home or the office.

■ **Organizers.** We've all seen how PDAs have assaulted the marketplace. It seems you can't go anywhere anymore without someone poking their stylus on a handheld device. However, not everyone needs the power and bulk of a PalmPilot or Handspring unit. The following devices offer a good deal of functionality for just a little sacrifice.

Sharp OZ-730PC Organizer. Looking for a good value-priced alternative to today's Palm- and Windows CE-based handhelds? Look no further than the OZ-730PC ($99.99; 800/237-4277; http://www.sharp-usa.com), a 9.5-ounce heavy hitter that sports a wide 40-character by eight-line backlit LCD (liquid-crystal display) and downsized QWERTY keyboard. A fully functional PIM (personal information manager) is included that synchronizes with your PC, and the unit's 1.5MB of memory can store thousands of addresses, calendar events, memos, and more. Surf over to Sharp's MyWizard.com (http://www.mywizard.com) site and you'll find hundreds of games, utilities, and travel tools available for download that you can synch with the OZ-730PC. Day-Timer Synch software is included, and a conduit for synching with Microsoft Outlook is optional.

Xircom's REX 5001 Organizer. Even the slimmest PDA may still be too bulky for your liking. If all you want is a simple, effective, convenient way to manage and synchronize your PIM data, then the REX 5001 ($99.99; 800/438-4526; http://www.xircom.com) is your solution. Weighing only 1.4 ounces with its twin lithium batteries, this REX is actually a Type II PC Card that hardly makes a dent in a shirt pocket. Just slip it into your notebook's card socket to synch with ACT!, Outlook, and several other popular desktop managers. The device features a nine-line, 160 x 90 pixel monochrome LCD that is quite legible and makes the PDA a breeze to operate. The 5001 model also ships with a serial docking cradle in case you're only using the REX in conjunction with a desktop PC.

■ **Input Devices.** Although PDAs and notebook computers give you great power when you're on the go, they can be pretty difficult to input data into. Luckily, vendors have been developing input devices that make it a little easier to get your thoughts recorded.

Cirque Smart Cat touchpad. Here's a common portable computing scenario: You're in a car or airplane seat trying to work on your notebook. Quarters are cramped and there are no hard flat surfaces for your plug-in mouse. Using your notebook's built-in pointer is a real drag because you find it inconvenient and inaccurate. What do you do? Try the Smart Cat ($59.95; 801/467-1100; http://www.cirque.com). Just glide your fingertip along the touchpad's surface to move your on-screen pointer. The Windows-compatible device has four buttons (three are programmable) and very robust drivers that allow you to scroll horizontally, vertically, and even zoom in and out on documents with just a slight drag. More powerful and convenient than a mouse, the Smart Cat is an outstanding traveling companion that just may find a home on your desktop, too.

Palm Computing's Portable Keyboard. PDAs are outstanding productivity tools, but it's no secret that composing long memos on them is something between tedious and impossible. Palm's Portable Keyboard ($99; 800/881-7256; http://www.palm.com) solves the input problem by offering a nearly full-sized keyboard that folds up along three hinges into a tidy package that is barely larger than the Palm itself. The unit weighs a mere 7.9 ounces, and although it's too bulky for a shirt or pants pocket, it does stow away nicely in a coat pocket, briefcase, or glove box.

■ **Audio.** Perhaps no segment of the portable market has seen as much growth as audio. You'll find a litany of devices that allow you to play music, record voices, and even communicate. Here are some of the best gadgets you can find for a song.

Easybuy2000 MpTrip. The trouble with most MP3 players is that memory media remains fairly expensive when weighed against the amount of song time you get. And, most portable CD players remain unable to recognize MP3 files although this will probably change soon. One of the first players to support both formats is the MpTrip ($87; 877/505-4689; http://www.easybuy2000.com). Now, by burning your CD-Rs (CD-recordables) with MP3 files instead of WAV files, you can get roughly 10 hours of music on a single disc. The MpTrip features an antishock system, can record up to 500 seconds of audio from a microphone with its built-in memory, and has surprisingly good bass response for such a small player. However, the player's documentation is still a bit flimsy, which is why Easybuy2000 is only selling it directly over the Web, figuring that Web-based customers will have more technical savvy. But once you learn how to navigate the device, its value and quality become obvious.

I-JAM IJ-50. Styled in translucent blue and platinum, the IJ-50 ($99.95; 888/326-4526; http://www.ijamworld.com) may look like a toy, but it roars along with the best of portable MP3 players. Although competing products often sell for $200 to $300, the IJ-50 achieves its value price tag by not including any memory. Whereas many other players come with a certain amount of internal flash memory and perhaps an optional expansion slot, the IJ-50 simply uses a CompactFlash card port. If you already have, say, a 32MB CompactFlash card for your digital camera, just load the card with MP3 files and stick it in your IJ-50. The player comes bundled with MusicMatch software for PCs and SoundJam MP for Macs. Controls are simple and intuitive and allow even novices to take their audio on the road with ease.

Labtec Axis-002 headset. Wearing a standard headset for hours can literally become a headache. You may have seen some people walking around listening to their CD or MP3 players with these hip new headphones ($29.99; 360/896-2000; http://www.labtec.com) that abandon the old over-the-top band design and instead use a band that sneaks around the back of your neck, just below the skull. The headphones sound great, and the microphone boom is slender and unobtrusive, featuring both a mute switch and volume control. For music, gaming, and voice-over-IP (Internet Protocol) applications, the Axis-002 is a value-packed way to take a load off your mind.

The Labtec Axis-002 headset is a comfortable way to hear great sound.

LandWare goVox digital recorder. If you like the utility of a digital voice recorder but loathe the idea of weighing yourself down with yet another gadget, try the goVox ($64.95, $54.95; 800/526-3977; http://www.landware.com) for your Palm. The device replaces your Palm's regular plastic cover and adds only an extra fraction of an inch to the whole unit's thickness. You can record up to eight minutes (about 99 messages), and because the goVox runs off its own battery, your Palm's regular batteries remain unaffected. The $64.95 price is for Palm V family models, but the Palm III family version is available for $54.95.

Motorola Talkabout T289 radio. So, you have a bunch of tech toys to keep you going this way and that on the road, but now you need a way to stay in touch with those traveling with you. The Talkabout T289 ($99.99; 800/353-2729; http://www.motorola.com) is a bit low-tech in that it doesn't interface with a computer, but its necessity and convenience hardly suffer from the fact. The T289 will keep you connected with other Talkabout-armed people in your group up to a range of two miles. This model offers 14 primary channels with 38 codes per channel to make sure there's almost zero chance of other wireless users dropping in on your conversation.

Sony ICD-37 digital recorder. Small enough to fit in your palm, the ICD-37 ($79.95; 800/222-7669; http://www.sel.sony.com) has any analog microcassette recorder beat hands down. Whether you're in the car, walking down the street, or resting in your favorite chair, the ICD-37 lets you record up to 45 minutes of your thoughts on to a Sony Memory Stick. You can record as many as 297 messages across three different folders, and because the recordings are digital, you can immediately jump to any of them without fast forwarding or rewinding.

European travelers will find Franklin's TWE-106B European translator to be an invaluable tool.

Sony MDR-NC5 headphones. Sony's MDR-NC5 headphones ($99.99; 800/222-7669; http://www.sel.sony.com) use built-in microphones to sense the annoying sounds of road noise and other auditory clutter in the 40Hz to 1.5MHz range and then issue contrary wave signals through the headphone speakers to blot out these noises. The result is a refreshingly clear sound experience when you're trying to enjoy music outside. With a folding headband and top-grade speaker construction, the MDR-NC5 headphones require only a single AAA battery and come with their own carrying pouch.

SRS Labs WOW Thing. Most budget-oriented portable audio gear sounds, well, cheap. The audio seems tinny, almost as if you're hearing it through a long can. Often, this is the result of the cheap speakers or headphones that shipped with your computer or music player. However, WOW Thing ($39.95; 800/243-2733; http://www.wowthing.com) moves you by adding a surprisingly rich layer of bass on top of your regular two-channel audio. Just plug the small translucent blue box between your speakers/headphones and sound card or portable player. Your audio will sound bigger, richer, and deeper, even on cheap equipment.

Cameras.

Digital cameras, whether they take still shots or full-motion video, are liberating many users from the foibles of film. Although digital cameras have been out for a while, we're just now seeing affordable, ultra-portable options. Here are some of the best.

KB Gear JamCam 3.0. When you want a fun digital camera that makes digital imaging an affordable cinch, try the JamCam 3.0 ($99.99; 952/656-6000; http://www.jamonline.com). With resolutions at either 320 x 240 or 640 x 480 pixels, the JamCam won't capture images suitable for printing, but they'll do just fine for Web-based viewing or sharing by e-mail. The camera comes with both serial and USB (Universal Serial Bus) connections, so you can use it with either Windows-based PCs or Macs, and it stores pictures on removable MultiMediaCard memory. The JamCam 3.0 comes in blue or silver, offers a built-in flash, and has a handy LCD to show the camera's settings.

Kodak DVC325. The DVC325 ($99; 800/235-6325; http://www.kodak.com) is a USB-based Web cam that comes with monitor, notebook, and tripod mountings; has a respectable 50-degree field of view; and can swivel 75 degrees. Although it is only rated for down to 200 lux (a unit used to measure a camera's sensitivity to light; the lower the lux number, the less light it will take to produce a clear image), keep in mind that the lower the available light, the lower the frame rate the camera can offer. Under regular conditions, the DVC325 can output 30fps (frames per second) at 176 x 144 pixels and up to 8fps at 640 x 480 pixels. Even better, though, the camera separates from the base and has a manual shutter release button. Used with the 9.8-foot USB cable, the unit turns into a low-end handheld digital camera.

PAR Technologies iREZ KritterUSB. The KritterUSB ($99.95; 480/922-0044; http://www.irez.com) is a slick little Web cam that either rests on your desktop or perches atop your notebook screen with its long, otherworldly legs. Technically, this slender cyclops ranks among the best of consumer Web cams, with light sensitivity down to 1 lux (almost complete darkness) and the ability to focus from 1mm to infinity. Video bandwidth is scalable up to 7.5Mbps (megabits per second) on the USB channel, and the camera's software offers a commendable range of image controls.

It may look funny, but the iREZ KritterUSB is a digital camera with great light sensitivity.

■ **Miscellaneous Accessories.** Sometimes the most useful items don't fall into cut-and-dried categories. Although we can't lump these items under one banner, all will provide an invaluable service to the mobile user.

Arkon Resources' CM228 Universal Multi Angle Palm-Sized Computer Kit. You've probably seen people with paper notepads stuck to their cars' windshields by suction cups. Being a PDA user, you probably resist such old-school solutions like paper pads but still admire the convenient placement these people enjoy. Arkon's mounting kits give you the best of all worlds. The CM228 ($49.95; 626/254-9005; http://www.arkon.com) fits most PDAs, keeps your stylus in easy reach, and has a small internal compartment for extra styli or batteries. The unit either sticks to or screws into your vehicle's cup holder, dashboard, or any other convenient surface. The CM228 will help you keep both hands free and your eyes on the road.

Franklin TWE-106B European translator. Few things dampen the mood of an overseas trip like being unable to communicate. Fumbling with a dictionary is a pain, as is carrying several dictionaries if you plan on hopping across numerous national borders. If this sounds like a problem for you, pick up Franklin's TWE-106B ($24.95; 800/266-5626; http://www.franklin.com), which translates more than 175,000 words and phrases in English, Spanish, French, German, and Italian. Additionally, 4,000 phrases are grouped into common conversation categories, such as Shopping, Travel & Directions, and Emergencies. The device includes a calculator, metric/currency converter, and has the ability to store a limited number of names and phone numbers. Barely the size of a passport, this translator belongs in any Euro-traveler's carry-on.

SanDisk ImageMate USB. With so many flash memory products in your digital gadget collection, keeping track of each one's data cables can become a real problem. SanDisk's ImageMate ($50; 408/542-0500; http://www.sandisk.com) lets you stick all those cables in a drawer and forget about them. This flash media reader is small enough to fit in your palm or pocket and, when plugged into your computer's USB port, functions like any other drive. Just slide your media card into the ImageMate's slot and you can add, copy, and delete files from your media just as if it were a diskette or Zip disk. ImageMate USB, which is available in CompactFlash, SmartMédia, and MultiMediaCard versions, transfers files more than 30 times faster than a direct serial connection, which can save you valuable time on the road.

Targus DEFCON 1 notebook security alarm. If you've ever felt nervous about putting down your notebook in a public place, you need Targus' DEFCON 1 ($49.99; 800/998-8020; http://www.targus.com). Only 6.4 ounces with a 4.7-foot steel cable, the DEFCON 1 is a small motion-sensitive box. Its cable loops through your notebook's security lock slot adapter or carrying case. The box uses a three-digit security code and has two motion sensitivity settings. All you need to do is connect the cable and walk away from your notebook with confidence. If an intruder jiggles the sensor or cuts the cable, DEFCON 1's light flashes and the device lets out a searing 110-decibel wail. This unit carries a small price for such large peace of mind.

Targus Notebook Backpack. Spend an hour or two toting around any notebook and you'll quickly realize the drawback to most notebook carrying cases. Even with a soft strap, the weight that bears down on one shoulder over time can become extremely unpleasant. You wear the Notebook Backpack ($69.99; 800/998-8020; http://www.targus.com) over both shoulders just like a regular backpack, freeing your hands and arms and relieving the pressure on your neck and shoulder. The straps are cushioned, there is a top-mounted handle, and the bag is designed with lots of pockets and file compartments. 65

by William Van Winkle

Inexpensive Peripherals

Outfit Your Computer For Under $100

The days are long gone when you need the economic resources of a small country to buy a new computer system. You can now buy fast, basic systems for a few hundred dollars, and you can easily add high-quality, low-cost peripherals to extend your system's functionality. Each of the following products comes in under the $100 retail limit, and all offer the top quality and rich features you'd expect to spend much more money for.

■ **Printers.** Sure, you could spend hundreds of dollars for a laser printer (and an equal amount to run it for a year), but for most printing projects,an inkjet printer will do just fine. And you sure can't beat the price.

Epson Stylus Color 777. While the Epson Stylus Color 777 ($99; 562/290-4401; http://www.epson.com) is the most expensive of the printers we're featuring, it also offers the most speed. It can roll out 8ppm (pages per minute) of black text and 6ppm of color. The Stylus Color 777 features four-color printing, built-in USB (Universal Serial Bus) /parallel connectivity, and an impressive resolution of 2,880 x 720 dpi (dots per inch) on photo paper. Compatible with Windows 95, 98, 2000, and NT 4.0, as well as Mac 8.5.1 or later systems, the Stylus Color 777 weighs 8.4 pounds and measures 17.7 inches x 10.1 inches x 6.8 inches. In addition to a one-year warranty and printer software, the Stylus Color 777 also ships with a 100-sheet input paper tray and has an automatic ink low/ink out detection system.

Canon BJC-2100. With the help of a $50 rebate, Canon manages to sell an already inexpensive printer for an even lower price. The 720 x 360 dpi BJC-2100 ($49 with rebate; 516/488-6700; http://www.ccsi.canon.com) works with both Windows (95, 98, 2000, Me, NT 4.0) and Mac (8.1 or later) systems and gives you the option of connecting it with either USB or parallel ports. The BJC-2100 offers four-color, Bubble Jet ink-on-demand printing at a rate of 5ppm for black text (with an optional BC-20 Black BJ Cartridge) and 2ppm in color.

The printer measures 6.5 inches high x 14.6 inches wide x 7.5 inches deep and weighs 5.3 pounds. Some of its special features include duplex printing (which means it can print on both sides of a regular sheet of paper; this is for Windows users only), a drop-in loading system for easy cartridge loading, and the option of combining the BJC-2100 with an IS-22 Color Image Scanner Cartridge to turn the printer into a color sheeted scanner. The BJC-2100 comes with a one-year warranty.

Lexmark Z32 Color Jetprinter. The last of the printers we cover falls between the other two in terms of price. The Lexmark Z32 Color Jetprinter ($69.99; 888/539-6275; http://www.lexmark.com) offers a resolution of up to 1,200 x 1,200 dpi and can print up to 7.5ppm of black text and 3.5ppm of color. The Z32 is compatible with Windows 95, 98, Me, 2000, and NT 4.0 and also works with Mac systems 8.6 or higher.

Special features of the Lexmark Z32 include Accu-Feed paper handling (which can handle various paper weights without hassle), a built-in ink level indicator/job status indicator, and a customer choice software offer. As an added bonus, Lexmark offers the Lexmark Rewards Club, which is packed with projects, graphics, tips, and more. You can access the Rewards Club through Lexmark's home page.

The Z32 weighs 5.3 pounds, measures 6.7 inches high x 17.6 inches wide x 8.3 inches deep (with trays retracted) and comes with a one-year LexExpress next business day exchange warranty.

■ **Scanners.** You've been able to buy a scanner for under $100 for some time now. The good news in this arena is that scanners for less than $100 now offer higher quality and increased features. Both of the following scanners offer much in terms of both quality and a rich feature set.

Microtek ScanMaker X6 USB. Microtek's Scanmaker X6 USB ($99.99; 800/654-4160; http://www.microtek.com) dipped under our $100 limit with but a penny to spare. The ScanMaker X6 USB offers 36-bit color at a resolution of 600 x 1,200dpi. You won't have any problems setting up this

scanner; its USB connection makes it easy to plug in and start scanning right away. Another feature that makes this an easy scanner to use is a Go button that lets you easily launch the scanning software. The ScanMaker X6 USB is available for Win98 and the iMac and Apple G3 systems. It weighs 11 pounds and measures 3.2 inches high x 11.5 inches wide x 17.3 inches long.

Special features of the ScanMaker X6 USB include technologies such as Color Enhanced Optimization (for auto color calibration) and Zero Reflection Design Technology (to reduce light "bounce back"), as well as the ability to scan positive 35mm slides with the included LightLid 35. In terms of "normal" scanning, the Scanmaker can scan up to letter-sized documents.

Like all good scanners, the ScanMaker X6 USB comes packaged with a wealth of software goodies such as Adobe PhotoDeluxe (photo editing for Windows and Mac systems), Ulead PhotoImpact (image editing for Windows), Caere PageKeeper Standard (document management software for Win98), Caere OmniPage Limited Edition (OCR [optical character recognition] software for Windows and Mac systems), and more. You can also get optional items such as a 10-page document feeder and a 5- x 6-inch transparency adapter.

UMAX Astra 3400. With its 14-bit internal analog-to-digital converter (for true 42-bit internal color), the UMAX Astra 3400 ($99; 510/651-4000; http://www.umax.com) promises to deliver great color to your scanned images. The Astra 3400 costs just a little less than the Microtek ScanMaker X6 USB, but the Astra shares many similarities with its competitor. Like the ScanMaker X6 USB, the Astra 3400 offers a resolution of 600 x 1,200 dpi, the ease of a USB interface, and push-button functionality. The maximum scan size of the Astra is 8.5 x 11.7 inches, and it is compatible with both Windows (98, 2000) and Mac (OS 8.1 or later) systems. Even the size of 18.2 x 11.6 x 2.6 inches is a near mirror image of the ScanMaker X6 USB.

Special features of the Astra 3400 include the ability to batch scan (scan multiple images in one scan job) and the inclusion of its Intelligent Imaging Process Engine, a feature that automatically optimizes images and text. The Intelligent Imaging Process Engine can automatically detect whether your document should be in color or grayscale, auto-assign the optimum resolution, auto-crop images, auto-rotate askew images, and more. The Astra 3400 also offers a rich collection of software, including Adobe PhotoDeluxe, ScanSoft OmniPage LE, NewSoft Presto! PageManager, UMAX VistaShuttle (for greeting card construction and more), and NewSoft Page Type.

■ **Storage.** While mass storage units aren't usually that expensive, there are very few that fall beneath the $100 mark. One that does, though, carries a name that should be instantly recognizable.

Iomega External Zip 100MB USB Drive. Like Xerox and copiers or Kleenex and facial tissues, Iomega's Zip 100MB USB Drive ($99.95; 888/446-6342; http://www.iomega.com) was pretty much synonymous with mass storage for many years. As the number of players and formats, including Jaz, Orb, and SuperDisk drives, flooded the field, however, the Zip Drive lost a lot of that exclusive feel, but it still has quality and a lot more going for it.

The external USB version of the 100MB Zip Drive retails for $99.95 and is capable of storing up to 100MB of data per disk. (You can buy a 250MB version.) The disks themselves are fairly in expensive (approximately $10/disk through Iomega), so you can cheaply store a lot of information and easily carry it around with you. The drive is compatible with both Windows (95, 98, 2000, ME, NT 4.0) and Mac (OS 8.5.1 or later) systems.

With the help of a $50 rebate, you can get the already inexpensive Canon BJC-2100 for an even lower price.

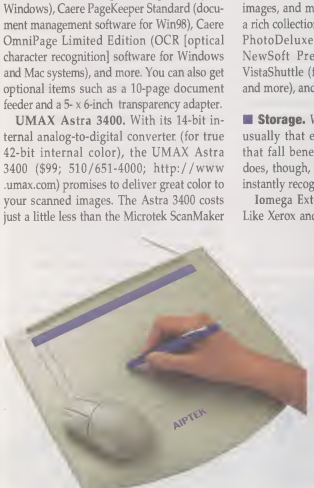
The USB Zip Drive comes with a variety of software to help you get the most out of the drive, including RecordIt (record and play back voice or music), 1-Step Backup (easily protect your files), Copy Machine (duplicate entire disks), and a collection of utilities called IomegaTools. You can also get accessories such as battery packs and carrying cases.

■ **Input Devices.** Writing tablets, mice, gaming devices, and keyboards are just a few. Input devices for computers come in all shapes and sizes, and the functions they perform, from entering text to blasting away aliens, are equally diverse. They do have one primary thing in common, though: Without input devices, you wouldn't get much done on your computer. The devices we've collected here also share a sub-$100 price tag.

Aiptek HyperPen 8000. If you think computerized drawing pads are just for doodlers and artists (aka, professional doodlers), you may be surprised to learn some of the things that you can do with them.

Take the Aiptek HyperPen 8000 ($99.99; 949/455-1800; http://www.aiptek.com), for example. This drawing pad's MetaCreations Art Dabbler software not only lets you draw but it also gives you painting and animation capabilities. You can also create and verify electronic signatures (with CADIX software), mark up Web pages and other desktop layouts and save or send them via e-mail (with ScreenDraw software), and even annotate Microsoft Word documents. The HyperPen 8000 can pretty much do anything your imagination (with the appropriate software) can think up, including handwriting recognition, electronic presentations, and videoconferencing.

The HyperPen 8000 features an 8- x 6-inch pad, a cordless pen and mouse, a resolution of



The Aiptek HyperPen 8000 is an input device that will let you experiment with your creative side.

3,048lpi (lines per inch), and connectivity to your USB port.

Logitech iFeel Mouse. If you feel that your mouse isn't responsive enough, perhaps you should give the Logitech iFeel Mouse ($39.95; 800/231-7717; http://www.logitech.com) a spin. When we say responsive, we aren't talking about the ease with which it scuttles across the mouse pad. Logitech has developed the iFeel to set up vibrations when the mouse pointer moves across an icon, menu, toolbar, or hyperlink.

"Why?" you ask. The technology actually has some practical applications, including using it as an aid to new users (so they know what items are clickable) and as an aid to the visually impaired. Even if you're just looking for something different in a mouse, the iFeel will certainly give you that.

In addition to providing tactile feedback, the iFeel Mouse is also a pretty decent three-button mouse for both left- and right-handed users. It uses optical technology for greater accuracy and, because it doesn't have a mouse ball, you don't have to clean it. The iFeel Mouse works with Windows 98, 2000, and higher and plugs into your USB port. The iFeel comes with a five-year warranty, and while there are only a few applications that can utilize iFeel's features now, expect many more to be fully iFeel compatible in the near future.

Microsoft IntelliMouse Explorer. If you'd rather go with a mouse that does not compete with your vibrating pager for your affections, give the Microsoft IntelliMouse Explorer ($75; 425/882-8080; http://www.microsoft.com) a whirl. The IntelliMouse Explorer uses an optical sensor to scan the surface it's on 1,500 times per second, and you can pretty much use it on any surface. Because of the sensor, there is no mouse ball, hence no build-up of gunk and no cleaning chores when the mouse starts dragging.

The IntelliMouse Explorer is designed in an arched shape to more closely fit the palm of your hand, and its rubberized sides are flared for better grip and feel. It comes with two side buttons that are programmed to act as forward and back buttons on your browser. You can reprogram these or any of the buttons to open your favorite programs, documents, and more. The IntelliMouse Explorer also comes with a wheel for scrolling or zooming (for use with Microsoft Office97 compatible or later applications).

The IntelliMouse Explorer from Microsoft is an optical mouse, so there is no mouse ball to clean.

Designed exclusively for right-handed users, the IntelliMouse Explorer is covered by a limited lifetime hardware warranty and works with either a Windows or Mac PS/2 or USB port.

Flight Sim Yoke PC. We move into the realm of gaming devices with the Flight Sim Yoke PC ($99.95; 760/598-2518; http://www.chproducts.com;) by CH Products. Flight sim fans of all stripes will love this yoke. It provides yoke movement that is specially designed for user comfort; pre-cision trim controls; and three axis of control including pitch, roll, and throttle lever. Its 14 button functions give you a gear switch, slap switch, four-way hat switch, two two-way rocker switches, and three push buttons.

The $99 Monsoon MH-500 from Sonigistix is a great deal for a flat speaker system.

The Flight Sim Yoke PC comes with a 7 foot cable that plugs into a standard PC game port (USB is also available for a little more), and it is supported by all major flight sim software. It works with Windows 95, 98, 2000, Me, and DOS, and you can use it with other CH Products gaming devices such as Pro Pedals or Pro Throttle to really enrich your gaming experience.

Microsoft SideWinder Precision Pro. Those looking for a more traditional gaming device may want to consider the SideWinder Precision Pro ($74.95; 425/882-8080; http://www.microsoft.com) from Microsoft. The SideWinder Precision Pro uses digital-optical technology to give you excellent accuracy, breathtaking speed, and no drift. The stick itself features 16 programmable button functions, an eight-way hat switch, trigger, throttle wheel, handle rotation, and axis movements. You can program all of these features using the SideWinder Game Device Profiler software. You can also easily adjust the sensitivity of the SideWinder, program your best moves into the device, and save winning profiles for future use.

The Sidewinder Precision Pro works with Windows 95 or higher and plugs into either your computer's game or USB port.

Acer WIL-172 Wireless Keyboard. Writing pads, mice, and gaming devices are all well and good, but how about the workhorse of input devices, the keyboard? It's possible to find many excellent keyboards for under $100, but would you believe that you can also find a wireless keyboard that easily fits our pricing requirements?

The Acer WIL-172 Wireless Keyboard ($45; 408/432-6200; http://www.acer.com) is one such device. This keyboard from Acer Communications and Multimedia America lets you input data from up to 30 feet away. While you'd have to be pretty sure of your typing to get a whole lot of use out of it at that distance, having the freedom to move the keyboard from surface to surface without worrying about the cords is a definite selling point. The Acer WIL-172 uses infrared wireless technology to perform its wireless tricks, sending signals to a serial and PS/2 mouse port receiver. Among its features are 84 keys and a built-in mouse function with two click buttons.

The Acer WIL-172 comes with a one-year warranty and uses two AA batteries (which, according to Acer, can last for three months). In addition to classic gray, the keyboard is also available in black.

■ **Web cameras.** Web cameras, also known as Web cams, have a wide range of uses beyond the obvious one, which is putting your face or your sleeping cat online. With a Web cam, you can send video e-mail; set up a surveillance system to watch over your computer, front door, or sleeping child; or participate in an online meeting or video phone call. You can also use Web cams to snap and edit still shots of anything within the cable's range. The following cams give you access to all these functions for under $100.

Logitech QuickCam Pro USB. The Logitech QuickCam Pro USB ($99.95; 800/231-7717; http://www.logitech.com) offers a wide range of features and functionality for all users regardless of their needs. The QuickCam Pro offers a 24-bit 640 x 480dpi resolution and provides video at up to 15 frames per second. The cam ships with a Labtec LVA-330 headset microphone to give you video and audio solutions all in one package, and its Charged Coupled Device (CCD) sensor allows for sharp, clear pictures under a variety of lighting conditions.

The software that ships with the QuickCam Pro allows you a wide range of functionality, from video surveillance with Digital Radar II to video conferencing with Microsoft's NetMeeting. The QuickCam Pro also comes with MGI's VideoWave II and PhotoSuite II image editing software, video games from Reality Fusion, CrestaCards Video Greeting software, and much more.

The QuickCam Pro works with Windows systems, and you'll need a USB port to plug the Web cam into.

Creative Labs Blaster Webcam 3. Creative Labs offers a powerful Web cam with its Video Blaster Webcam 3 ($50; 831/438-5330; http://www.webcam.creative.com). The Webcam 3 is capable of 16.7 million colors and can capture video at 30 frames per second (at a resolution of 352 x 288dpi) or 15 frames per second (640 x 480dpi). The Webcam 3 is compatible with Windows and offers parallel or USB port connectivity. You can easily take snapshots with a handy button on top of the cam, and it comes bundled with ArcSoft's Polaroid PhotoMAX software to edit, re-touch, and add effects to photos. Like the Logitech QuickCam Pro, you can use the cam for a variety of different purposes, including sending video e-mail, remote monitoring, and more.

■ **Speakers.** When it comes to computer system speakers, many users may be tempted to patch an old pair of stereo speakers into the back of their computers, but this can be a less-than-ideal solution. Stereo speakers generally lack the shielding features that computer speakers have, resulting in monitor interference and other possible problems with the speakers' powerful magnets. They also tend to take up a lot of space, unlike the two speaker systems that follow.

The Iomega External Zip 100MB USB Drive retails for $99.95 and is capable of storing up to 100MB of data per disk.

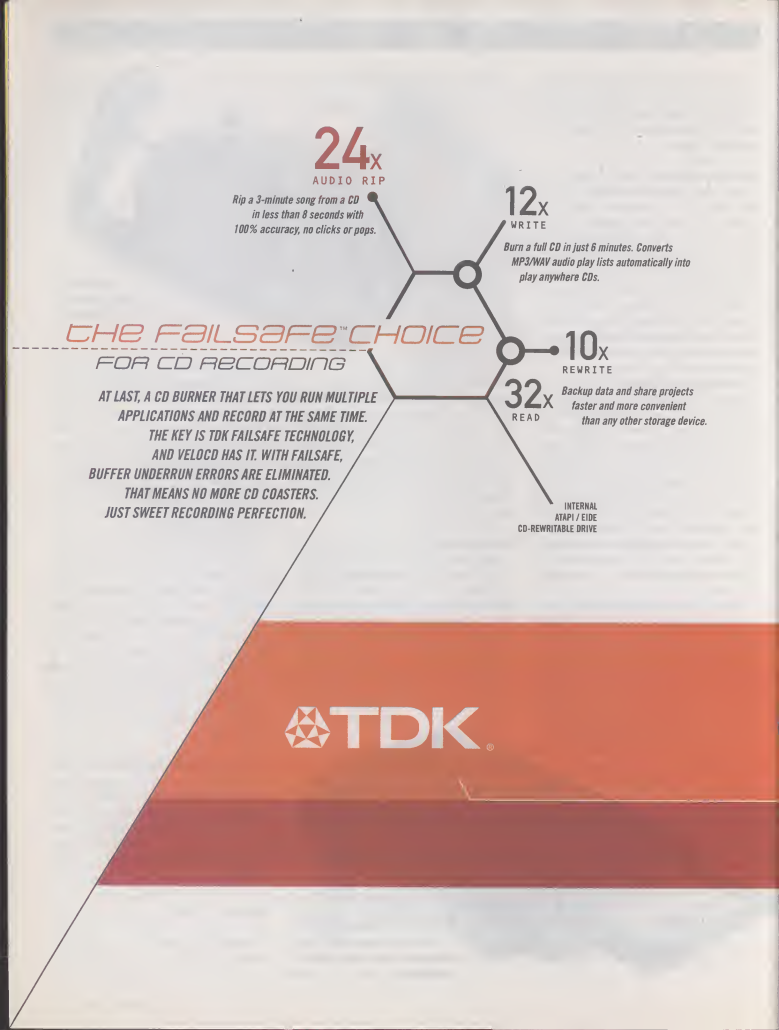
Flight sim fans of all stripes will love the Flight Sim Yoke PC from CH Products.

Altec Lansing ATP3 3-Piece System. The ATP3 3-Piece System ($99.95; 570/296-6887; http://www.alteclansing.com) from Altec Lansing features two slim profile speakers and a wooden subwoofer. Separate controls for master volume, bass, and treble give you flexibility in mixing the sound output, and the system has a good frequency response of 45Hz (hertz) to 18KHz (kilohertz). The ATP3's satellite is 12 watts and the subwoofer is 18 watts.

Sonigistix Monsoon MH-500. The Monsoon MH-500 ($99; 501/372-0366; http://www.sonigistix.com) from Sonigistix is another system that comes in just under the $100 limit. It's a great deal for a flat speaker system with a pedestal design. The Monsoon features an integrated amplifier/subwoofer, two satellite planar focus speakers, and a volume control puck for easy one-button muting and volume control. The frequency response of this system is 50Hz to 20KHz. The amplifier power is 51 watts total and the subwoofer is 17 watts.

■ **Save Yourself Some Money.** You need not go broke outfitting your system with high-quality peripherals. Most categories offer enough of a selection in the sub-$100 range that a simple feature comparison will yield you a product that will meet your needs for both the present and the foreseeable future. GS

by Rich Gray


24X
AUDIO RIP
Rip a 3-minute song from a CD in less than 8 seconds with 100% accuracy, no clicks or pops.
12X
WRITE
Burn a full CD in just 6 minutes. Converts MP3/WAV audio play lists automatically into play anywhere CDs.
the failsafe™ choice
for CD recording
10X
REWRITE
32X
READ
Backup data and share projects faster and more convenient than any other storage device.
AT LAST, A CD BURNER THAT LETS YOU RUN MULTIPLE APPLICATIONS AND RECORD AT THE SAME TIME. THE KEY IS TDK FAILSAFE TECHNOLOGY, AND VELOCD HAS IT. WITH FAILSAFE, BUFFER UNDERRUN ERRORS ARE ELIMINATED. THAT MEANS NO MORE CD COASTERS. JUST SWEET RECORDING PERFECTION.
INTERNAL
ATAPI / EIDE
CD-REWRITABLE DRIVE
TDK

Mix your music and develop your Sweetspot for digital audio recording: www.velocd.tdk.com.

Affordable Gadgets & Accessories

These Tools May Not Be Necessary, But They Make Computing More Fun

In most cases, computer gadgets and accessories aren't necessary to your every day computing routine. Usually, users buy these items to make annoying tasks easier or just because they are fun. Because gadgets and accessories could be considered superfluous, most people aren't anxious to spend lots of money on them, so we've scouted out some cool gadgets that won't leave you broke: All of them cost less than $100.

■ **Powerless Products.** As odd as it may seem, everything computer related does not necessarily have to come with a cable or a power cord. The following two items are examples of products that, while powerless, are going to wind up on many users' "essential" list.

Intrigo Lapstation. Intrigo offers a variety of work-anywhere lapstations, including an entry-level model for just $89. Notebook owners who are sick of trying to balance their computers on their knees will want to try out the Lapstation ($89; 805/494-1742; http://www.intrigo.com). Weighing just 5.6 pounds, the Lapstation is sturdily constructed to stand up to the rigors of travel. It comes with expansion ports and dual side mesh pouches to keep your "office" materials at hand but out of the way. You even get your choice between midnight, sky, and mist colors.

The Lapstation offers an adjustable width of 27.5 inches to 32.5 inches and an adjustable height 10 inches to 11.5 inches. The Lapstation's work surface is 16 inches high x 25.3 inches wide, which should be big enough to hold most notebooks. Other models (priced at $139 and $189) offer additional features such as gel-filled wrist pads and pulverized aluminum in their construction. The Lapstation comes with a one-year warranty.

Belkin 65-Piece Tool Kit. When your gadgets break, you're going to need something to fix them, and the Belkin 65-piece tool kit ($77.99; 800/223-5546; http://www.belkin.com) should fit the needs of most people nicely. This kit offers many common tools for repairing or upgrading electrical devices and components. All the tools included here are fully demagnetized to en-sure against accidental drive damage, and they come with a custom designed case and a lifetime warranty.

■ **Phone Fun.** Because most users still use telephone modems to connect their computers to the Internet, it's no surprise that the computer/telephone link is a strong one. From devices that enable and improve Internet telephony (the process of placing phone calls using a PC) to telephone accessories that expand or improve your computer's functionality, these products all help you get the most out of your computer/phone relationship.

U.S. Robotics Internet Call Modem. When you're ready to jump into the world of Internet telephony, U.S. Robotics has a modem for you. Their Internet Call Modem ($99.95; 847/262-7000; http://www.usrobotics.com) gives you an Internet fax modem, Internet voice call capabilities, and online call management, all in one package. You can attach a telephone to this modem, and you can ring up another PC in the United States or Canada for free (using the included Net2Phone Internet Voice Call software).

The Belkin 65-Piece Tool Kit assembles all the tools you need for those do-it-yourself projects.

The Internet Call Modem combines a host of specialized features, from advanced technology that finds and avoids the slowdown areas in your V.90 connection, to an incoming call feature that pops up a window when you're online to let you know you have a call. (This feature requires caller ID and call waiting.) The Internet Call Modem also comes with the usual U.S. Robotics Connections CD, which is packed with a wide variety of software.

With the Wireless Mail Alert, you'll never again have to watch for a package to be delivered; this device will alert you when you have postal mail.

Yap Phone. Yap offers a variety of telephony products, most of which come in a little over our $100 mark. They do have a few products, such as the Yap Phone ($54.99; 888/581-0842; http://www.yapgear.com), that come in well under $100, though, and they offer great alternatives to trying to carry on a conversation over the computer with a traditional microphone and

Dick Tracy, move over. Casio's BZX20 PC Unite watch can download information from the Web to keep you organized and entertained.

speaker setup.

The Yap (for Your Alternative Phone), Phone was designed for those who wish to use a handset to place calls over the Internet. This device plugs into your USB (Universal Serial Bus) port and woks with Net2Phone software, which comes bundled with the phone. (Yap is actually a product of Net2Phone.) The phone weighs 180 grams, and according to the Yap Web site, works only with Windows 98 Second Edition. It offers various rates for sending calls (for example, from PC to phone in the United States, it costs 1 cent per minute; a call from PC to PC is free), and comes with a 2.7 meter cable, a $10 time card, Quick Start Guide, and more. Special features such as voice compression help to boost the quality of Internet phone calls.

Yap Headset. The Yap Headset ($44.95; 888/581-0842; http://www.yapgear.com), also from the same company, offers a hands-free solution for placing Internet calls and comes bundled with many of the same products as the Yap Phone (such as Net2Phone and a $10 time card). This headset with microphone works with Windows 3.1, 95, 98, and NT 4.0. Like the Yap Phone, it offers free PC-to-PC calling, as well as a variety of other pricing plans depending on how you use it and where you're calling.

Telephone Call-In-Control. The Telephone Call-In-Control ($63.95; you can purchase it online at places such as http://www.gizmocity.com) is a cool little gadget that lets you call the phone number the Call-In-Control is connected to, such as your home phone number, and turn on and off lights, appliances, computers, and more. The Call-In-Control has a number of obvious applications, from turning on and off lights while you're on vacation, to calling to turn on a home air conditioner before leaving the office for the day. For computers, you can call in to turn a machine on before exchanging information with it and then turn it off when you're done.

The Call-In-Control is very easy to use. Once it's set up, you just dial the appropriate number and wait until it picks up. (You can set it to pick up after anywhere from one to 10 rings, and it can be easily configured to get along with an answering machine.) Once it picks up, you turn on a device by pressing the star (*) key for three seconds, after which you'll hear *two* high-pitched tones. To turn off a device, you do the same thing: call in, press the * key for three seconds, and wait to hear *one* high-pitched. The Telephone Call-In-Control is a great gadget that can be easily moved from device to device with very little installation.

Phonex Broadband Wireless Phone Jack. Do you have a room without phone jacks, and you're not looking forward to paying a technician a bundle to put one in? Phonex Broadband produces a product called Wireless Phone Jack (801/566-0100; http://www.phonex.com/products_na.html) that will solve the problem without forcing you to rewire your house. The Wireless Phone Jack lets you use your electrical outlets as a phone jack. The Phonex package comes with a base unit that connects to your phone and any electrical outlet, an extension unit, and a 6-foot phone cord.

Phonex Broadband Wireless Modem Jack. The Wireless Modem Jack (801/566-0100; http://www.phonex.com/products_na.html) is a similar product from the same company. The Wireless Modem Jack is specially designed to support V.34 and V.90 modems. The modem jack also works well with set-top boxes. Both the Wireless Modem Jack and the Wireless Phone Jack are sold at various retail stores, such as RadioShack, so prices vary a bit, but you can expect to spend around $69 to $89 for the Wireless Phone Jack, and perhaps a little more ($99 or less) for the Wireless Modem Jack.

The 3D REVELATOR Glasses from ELSA will have you gaming in 3-D.

■ **Glasses, Watches & More.** Gadgets, more than any other type of product, are sometimes hard to categorize because they fill such a wide variety of needs. Here are a few products that you may find useful, even if they don't fall into a particular category.

Casio BZX20 PC Unite Watch. Dick Tracy, move over. Casio now produces watches that download information from the Web to keep you organized and entertained. While most of these watches are priced a bit over the $100 mark, the BZX20 PC Unite ($99; 888/932-2746; http://www.casio.com) sneaks under the mark and makes our list, the only PIM (personal information manager) on a wrist to do so.

The WinTV PCI board gives you your favorite program, sporting event, or newscast in a resizeable window that sits on your desktop.

Quite simply, using the PC Unite is like strapping a Palm Pilot on your arm. With the PC Unite, you can store contact, schedule, and PIM data downloaded from the computer. You can store up to 8,100 text characters on the built-in text browser, and you can set up the watch's alarm system to remind you of events. The watch is useful by itself, but Casio has made it even more useful by allowing it to synch with Cassiopeia and Microsoft's Outlook on your PC using infrared transmissions. (The watch comes bundled with an infrared adapter and software for your PC.) You can also easily exchange information between two PC Unite watches with the Business Card Exchange feature.

The BZX20 PC Unite is able to transfer information at a rate of 115,200bps (bits per second), and it has more "typical" watch features such as a stopwatch and the ability to tell time in different cities around the world.

WinTV PCI. Watching TV over the Internet on a 56Kbps (kilobit per second) modem is pretty lame. Watching TV from your cable or TV antenna using a WinTV PCI board is very cool. The WinTV PCI ($49.95 to $99.95; 631/434-1600; http://www.hauppauge.com) gives you your favorite program, sporting event, or newscast in a resizeable window that sits on your desktop. (You can resize the window from icon-sized to full screen.) The WinTV PCI offers a variety of features, such as a 125-channel cable tuner with automatic channel scan.

WinTV PCI comes with a number of software programs, including WinTV-SnapShot, which lets you capture high-resolution images in TIFF, BMP, GIF or JPEG file formats, CU-SeeMe; VDOnet; Connectix Video Phone; and more. External audio/video inputs let you connect satellite receivers, VCRs, or video cameras to your computer, and you can easily capture video and still images from all these sources to your desktop.

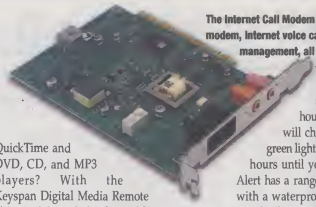
Available for Win95 or later, WinTV actually comes in a number of configurations, many of which come in under $100. For example, you can choose from a $49.95 mono sound model, a $99.95 version with dbx stereo and an FM stereo radio, and more.

Keyspan Digital Media Remote. Have you ever wished you had remote control over such applications as PowerPoint and QuickTime and DVD, CD, and MP3 players? With the Keyspan Digital Media Remote ($49; 510/222-0131; http://www.keyspan.com), you can easily control these applications from up to 35 feet away. The Digital Media Remote comes with an IR receiver that connects to the USB port of a Mac or Windows PC. You use the included 15-key remote to send the same signals you would if you were sitting at the regular keyboard. For example, if you usually press *N* to advance to the next slide in a presentation, you can use the remote to accomplish the same thing from farther away. The Digital Media Remote also comes with customization software that lets you customize the remote for use with almost any application you choose.

The Keyspan Digital Remote Control works with Win98, Windows 2000, and Windows Me or Mac OS 8.5.1 or later.

ELSA 3D REVELATOR Stereo Glasses. Utilizing the latest in stereo control technology, the 3D REVELATOR Glasses ($55 to $75; 408/961-4600; http://www.elsa.com) from ELSA promise to add a whole new dimension to games or other 3-D applications. To enjoy these glasses, you have to be using an ELSA graphics card and 3D REVELATOR drivers. The pass-through adapter cable you need comes with the glasses. In addition, the REVELATOR Glasses only work with games that support Microsoft Direct X version 6.0 or higher (most recent games do). The REVELATOR Glasses come with a one-year warranty.

The Wireless Modem Jack from Phonex Broadband is specially designed to support V.34 and V.90 modems, and it also works well with set-top boxes.



The Internet Call Modem gives you an Internet fax/modem, Internet voice call capabilities, and online call management, all in one package.

Wireless Mail Alert. This is the one product here that has absolutely no connection to your computer, but it was so cool we had to include it. With the Wireless Mail Alert ($79.95; 703/866-2000; http://www.designtechintl.com;), you can easily tell when the postal worker visits your mailbox. As soon as she opens the mailbox door, a mail alert sensor sends a signal to a receiver in your house. Once triggered, the receiver will chime every five minutes and a green light will continuously flash for two hours until you reset it. The Wireless Mail Alert has a range of up to 300 feet and comes with a waterproof mailbox sensor, mounting tape for the sensor, and a lithium battery.

CueCat Reader. We have seen the future, and it is about the size of a mouse and shaped like a cat, and it can quickly send you to the site of your favorite breakfast cereal. Digital Convergence's CueCat Reader (free; 800/993-7751 [$9.95/minute]; http://www.cuecat.com) connects to your keyboard port and lets you easily scan UPC and ISBN product codes to send your browser to a product's Web site, get coupons and recipes, and more. The CueCat is backed by such partners as *Forbes* and RadioShack; you can get a free CueCat from places such as RadioShack or order one from the CueCat Web site and simply pay the $9.95 shipping and handling charge. (The benefit of ordering one this way is that you'll get a free convergence cable, which lets you surf to Web sites mentioned on your TV.) CueCat works with Win9x, and a Mac version is in the works.

Privacy groups have raised concerns about the information that CueCat collects, and at the time of this writing there was still some question as to whether the company will adequately address these concerns. The problem in a nutshell is that Digital Convergence claims it will keep all information it collects private, but privacy groups question why it needs to collect this information in the first place. Even so, Digital Convergence hopes to have 50 million of its CueCat devices in consumers' hands within the next couple of years, so consumers will have to deal with this issue at some point.

■ **Make Computing Fun.** Sure they're not always absolutely necessary, but these gadgets and accessories all add an element of fun to your sometimes mundane computing tasks. They may even fulfill one of your computing needs, and for less than $100 you really can't go wrong. GS

by Rich Gray

Canon BJC-3000 Color Bubble Jet Printer

Right now, Canon is offering its BJC-3000 Color Bubble Jet Printer ($149) along with a $50 mail-in rebate offer. Although we usually don't recommend a product based upon its after-rebate price, $99 isn't a bad price for this printer.

The BJC-3000 has an individual ink tank system (which means you can replace an individual color instead of tossing a whole tank), 1,440 x 720dpi (dots per inch) resolution, and USB (Universal Serial Bus) and parallel port connections. It's a natural fit for normal and high-quality text jobs, but we hope you'll avoid its 360 x 360dpi draft mode. All text at the default and higher setting was very stark and sharp.

We used a parallel cable to connect the printer to an IBM PC with a 667MHz Pentium III processor, 192MB of RAM, and Windows 98 SE (Second Edition). Like Canon's S450 and BJC-2100 printers, the BJC-3000's box included a quick start guide, but like the other Canons, it didn't have a printed manual. Instead, the unit's manual is on CD-ROM.

The BJC-3000 maxed out at 2.88ppm (pages per minute) in our draft-quality text test. That's a decent speed, but the printer really flew in our other tests. It scored 1.7ppm in our PowerPoint test and 1.2ppm for our Word document, both at 720 x 360dpi resolution.

Photos weren't far behind, with a time of 7:29 to print a full-page image on photo paper and only 3:53 to print on normal stock. The BJC-3000 served up some colorful, clean photos and color graphics, but the graphics showed the same dithering pattern we noticed in the Canon S450's tests. The BJC-3000's floral photo image actually looked brighter and more vibrant than the S450's, but the image of a girl's face we printed could have benefited from Canon's optional photo ink cartridge ($49.99).

Like the S450, the BJC-3000 comes with a one-year warranty and a software package that includes Canon Photo, OfficeReady CC, and American Greetings' CreataCard SE. The printer can also use Canon's IS-32 scanner cartridge ($69.99), which allows you to scan documents into your computer.

The BJC-3000 is compatible with Windows 95, Windows 98, Windows NT 4, Windows 2000, and Mac OS 8.1 and newer. Complete print heads with full ink tanks sell for $37.99 (black) and $49.99 (color or photo assemblies). Individual replacement black ink tanks are $13.99; each of the three color and three photo ink tanks are $11.99 when purchased separately.

The BJC-3000 is a nice choice for economical, clean text jobs and light photo duty. Just don't forget to mail in that rebate form. GS

by Marty Sems

BJC-3000 Color Bubble Jet Printer

$149
Canon
(800) 423-2366
(714) 438-3000
http://www.ccsi.canon.com

Casio Cassiopeia EM-500

Wanting to prove that it too can offer colored cases, Casio released its Cassiopeia EM-500 PocketPC. The unit comes in five different colors and features a new MMC (multimedia card) slot for storage expansion and a faster processor than earlier PocketPCs from Casio.

The Cassiopeia EM-500 is small for a PocketPC. Measuring 5 x 3.25 x 0.75 (HxWxD), the Cassiopeia EM-500 is very similar in size to the Palm IIIxe (4.7 x 3.2 x 0.7). At 7.7 ounces, the device is also slightly heavier than the Palm IIIxe's 6 ounces.

The Cassiopeia EM-500 features a new VR4122 processor running at 150MHz, faster than the 131MHz processor included in the older Cassiopeia E-115. The new Cassiopeia also features a bright and clear TFT (thin film transistor) display that's bright and clear.

Like all PocketPCs, the EM-500 includes Microsoft Media Player for playing back MP3 and WMA digital music files. The stereo headphone jack and included stereo headphones provide adequate sound. Because the unit is only equipped with 16MB of RAM, you'll want to invest in an MMC card to expand your storage.

The MMC slot replaces the CF (CompactFlash) slot found on most PocketPCs. The MMC slot is smaller and consumes less power than a CF slot, but it does have some drawbacks. For instance, you can only use MMC for storage, so accessories such as CF modems and network cards won't work with the new EM-500. MMC cards also hold less information than CF cards.

We didn't like a few things about the device's design. The infrared port is badly placed at the bottom of the left side of the device, a fragile piece of rubber protects the MMC slot, and it's easy to accidentally push the voice-recording button.

The EM-500 costs $499. Even the high-end devices don't have enough RAM to house a decent MP3 collection, so the only users that will miss the extra memory are those with many third-party applications. The EM-500 is similar in price to the Hewlett-Packard Jornada 545, but design

problems aside, we liked the EM-500's display better. GS

by Chad Denton

Cassiopeia EM-500

$499
Casio
(888) 204-7765
(973) 442-5707
http://www.casio.com

HP Pavilion 8760C

Don't let the fact that Hewlett-Packard ships its Pavilion 8760C without a monitor deter you from taking a closer look at what this attractive and affordable PC does include. If you're a home user with multimedia, gaming, and Internet tastes that go beyond the basic, we think you'll like what you'll find for a $1,349 price tag.

At the Pavilion 8760C's core is an Intel Pentium III 733MHz processor that's fast and powerful enough to execute tasks the average home user will demand of it. Beyond the processor, there's both a Mitsumi CD-RW drive (24X/4X/4X speeds) for burning CDs and a Samsung 8X DVD-ROM drive for watching DVD movies. Also included are MusicMatch Jukebox software and a huge 40GB ultra DMA Maxtor hard drive to store MP3 files you're likely to create. HP also stacks the 8760C with a 56Kbps (kilobits per second) V.90 modem and a 10/100Base-T network card for connecting it to a home or office network.

The 8760C gears itself further to multimedia users by offering good expansion abilities on the mid-tower chassis. At the front of the case are a serial and two USB (Universal Serial Bus) ports ideal for connecting portable MP3 players, PDAs (personal digital assistants), and digital cameras. At the back are two additional USB ports and a parallel and joystick port. Inside, there's an AGP (accelerated graphics port), four PCI (Peripheral Component Interconnect) card slots (two open), and one open 5.25-inch bay. In addition, there's 128MB of SDRAM (synchronous dynamic RAM), which can be increased to 768MB via two open DIMM (dual in-line memory module) slots.

A few of the Pavilion 8760C's other characteristics mimic those of other Pavilions we've seen. First, the 8760C's interior is impossibly cramped and requires major rearranging to work inside the case. Just trying to view an open card slot through the mass of wires, cables, and ribbons is difficult, let alone trying to squeeze a hand in the interior without having to gut the interior first. Also characteristic of Pavilions are the configurations of the modem and audio card, which put the joystick port and speaker out jack on the modem and the microphone and audio out and in jacks on the Master Riptide PCI Audio card. In addition, the system's two Polk Audio Stereo speakers mount to the sides of the 17-inch Pavilion M70 monitor our review unit shipped with. The speakers are attractive but make the monitor especially wide.

Those gripes aside, the system's audio and video performance aren't bad considering the machine's sub-$1,500 price. The 16MB of video memory and integrated NVIDIA TNT2 Vantra 3D graphics aren't the best available, especially for a 733MHz machine, but are adequate for average users and keep the system's price down. The 8760C didn't score particularly well in our graphical-based performance tests compared to machines using the same processor, but we were pleased with the sharp and smooth images the monitor displayed during DVD playback, although the picture was a bit dark and murky. Our gaming experience rated as just satisfactory, but the distortion-free audio the Polk speakers cranked out was more pleasing. We felt that the volume topped out quickly and a subwoofer would have been welcomed.

We tested the Pavilion 8760C using MadOnion.com's Video2000 and 3Dmark2000 tests. Video2000 measures a system's video ability by assigning scores based in part on the processor, graphics card, memory, and motherboard. 3Dmark2000 evaluates a system's 3-D capabilities by using various tests for polygon counts, bump mapping, texture rendering speed, and image quality. In addition, we installed and played the 3-D game Quake III Arena and several audio CDs. We also used BAPCo's SYSmark2000, a suite of 12 application workloads divided into two categories: Office Productivity and Internet Content Creation.

The system's overall SYSmark-2000 score of 127 is about on par with other 733MHz systems we've reviewed, but its Video2000 and 3Dmark2000 scores lag behind. We've seen other 733MHz systems with Video2000 scores as much as 300 points higher than the 8760C's 2,189 mark and 3Dmark2000 scores as much as 2,000 points higher than the 1,781 score the 8760C posted. To be fair, nearly all the 733MHz systems we've seen used superior chipsets and video cards installed in an AGP card slot and had more video memory.

HP makes up for the graphical inadequacies by bundling a very good software package, including the Windows 98 operating system, Microsoft's Works 2000, Money 2000, and Encarta Deluxe Online 2000. In addition, there's McAfee's VirusScan, Quicken Basic 2000, Real Audio Player 6.0, Adaptec Easy CD Creator and DirectCD, and WinDVD 2000.

At $1,349, we can work around the omission of a monitor to get the considerable extras the 8760C offers at an affordable price. The system isn't the best performer we've seen, but it overachieves elsewhere. GS

by Blaine Flamig

Final Word: Not the best performer we've seen, but its components and software go a long way toward making up for that. A monitor isn't included in this sub-$1,500 price.

Features

Processor: 733MHz Pentium III
RAM: 128MB
Hard Drive: 40GB
Optical Drive: CD-RW, DVD-ROM
Connectivity: 56Kbps and NIC
Video Card: Integrated NVIDIA TNT2 Vantra 3D
Monitor: Not included
Chassis: Midtower

Pavilion 8760C

$1,349
Hewlett-Packard
(800) 752-0900
(650) 857-1501
http://www.hp.com

Intel Pocket PC Camera

The Pocket PC Camera from Intel isn't the first camera we've seen that functions both as a still digital camera and a Web cam, but it is the best we've seen in terms of quality and price. For just a buck under $150, the camera features an excellent software bundle, a sturdy and attractive design, and a Web cam quality that soars way above average.

Beyond these attributes, what really stands out about the Pocket PC Camera is its ability to easily detach its USB (Universal Serial Bus) connection to a computer and snap still shots or capture video away from a PC or notebook. It does this by using 8MB of internal memory, which is good for storing two minutes of video or 128 still shots taken at a top resolution of 640 x 480 pixels.

Although the Pocket PC adaptability is attractive, the camera isn't without some notable limitations. For starters, the quality of the still shots is really only good enough for posting to a Web page or attaching to e-mail. The 640 x 480 resolution won't render quality prints, and that resolution doesn't begin to approach the quality you'll get from a standalone digital camera. Not surprisingly, our still shots were a bit blurry and grainy.

In addition, the camera is constructed without a built-in flash, which will limit your picture taking to brightly lit environments and daytime shots. Also, there isn't an LCD (liquid-crystal display) at the back of the camera to preview and review shots, and there's little in the way of manual controls. That said, with a price of just $149 we expected the camera to omit some features.

As a Web cam, the Pocket PC excels. The camera's design appears to be identical to a basic point-and-shoot camera, but it actually fits snugly into a sturdy tripod bracket that lets the camera swivel 360 degrees and slightly side to side and up and down. The 6-foot USB cord conveniently plugs into the back of the camera, and there is a manual focus ring at the front. The lens has a 50-degree field of view and focuses from 10cm to infinity. When detached from the computer, the camera is easily small enough to slip into a pocket for traveling.

The Pocket PC grabs 30fps (frames per second) at 320 x 240 pixels and 15fps at 640 x 480. Video we viewed flowed smoothly and was extremely bright with good clarity. Colors were vibrant and accurate, but we did notice some graininess and lack of focus deep into backgrounds. The camera features automatic exposure and color control; it adjusted very well when we placed it in diverse lighting conditions. Overall, the camera's quality rates just slightly below the top Web cams we've seen.

As a bonus, the Intel Create & Share software the camera bundles with is wonderful. The software's main interface is extremely intuitive and features applications for making video phone calls, creating e-mail postcards, sending video e-mail, taking motion-detected snapshots from the computer, creating movies, building Web pages, and playing interactive games. MGI Photosuite image editing software is also included.

We don't recommend purchasing the Pocket PC Camera for its still digital camera abilities alone. The image quality the camera produces is only good enough for Web-related tasks. But if you're seeking an easy-to-use still camera that is also capable of performing as a very good Web cam, this model is definitely worth your attention. 6S

by Blaine Flamig

Pocket PC Camera

$149
Intel
(800) 628-8686
(916) 377-7000
http://www.intel.com/PCcamera

Sony CLIE PEG-S300

By far, Sony is the biggest Palm OS licensee to bring a product to market. The CLIE (pronounced KLEE-ay) PEG-S300 is a solid PDA and a good first product, but it has a lot of features that should either be removed or refined.

The Sony's Jog Dial navigator is one new feature that may improve with time. Currently, the Jog Dial, which lets users scroll through menus with one finger, only works with a handful of applications, but Sony is providing information to third-party developers who want to include Jog Dial support in their software. We were a little frustrated that you couldn't use the Jog Dial to return to the applications menu, but this isn't a major problem right now because you can launch four of the six Jog Dial applications using the hardware buttons on the bottom of the device.

While the Jog Dial is somewhat useful, a truly frivolous feature is the gMedia application that lets you play back video on your PDA. We've yet to see a compelling reason to offer this feature in any PDA, given current storage restrictions and the size of a typical video file. The 160- x 160-pixel grayscale display provides poor video quality, and the hardware is unable to provide any sort of sound.

Although the unit comes with a spacious 8MB of RAM, users can add extra storage space to the CLIE with Sony's Memory Stick. We were disappointed that you can't run applications directly from the Memory Stick, but Sony is working on a software workaround that will temporarily transfer applications to the unit's internal memory.

The CLIE measures 4.52 inches high x 2.79 inches wide x 0.6 inches thick and weighs 4.27 ounces. Both the Palm Vx and Sony CLIE sell for $399, but Sony's Memory Stick gives it a slight edge over the Palm Vx, especially if you own other Memory Stick devices. 6S

by Chad Denton

CLIE PEG-S300

$399
Sony
(888) 476-6972
(408) 432-1600
http://www.sony.com/clie

WinBook Si2 750

WinBook has been combining blistering speed and rugged construction at great prices for quite a while now. The company usually pulls this off by forgoing some of the gadgetry and polish that other manufacturers emphasize in favor of the bare essentials, and the Si2 750 is a prime example. It won't win any awards for artistic presentation, and it doesn't have such trendy features as front-edge CD player controls that some other notebooks include. Aside from these shortcomings, however, it did produce some very impressive benchmark scores for us. Even better, it costs $1,000 less than the next cheapest 750MHz notebook we've reviewed to date.

Specifications. You can get the Si2 with your choice of a 750MHz or 850MHz Pentium III processor. Ours came with the 750MHz Pentium III processor and 128MB of standard RAM, which you can expand to 256MB should the need arise. An 18GB Fujitsu hard drive serves as its main storage device and gets help from an integrated 1.44MB diskette drive and an integrated 4X4X20X Matshita CD-RW (CD-rewriteable) drive. The diskette drive and CD-RW drive both reside on the unit's left edge next to two USB (Universal Serial Bus) ports.

Other standard equipment on the Si2 includes an internal 56Kbps (kilobits per second) modem, a 14.4-volt Li-Ion (lithium-ion) battery, and ATI's RAGE Mobility-M video chipset with 2X AGP (Accelerated Graphics Port) support and 8MB of video memory. The video controller supports 1,024 x 768 resolution and the Si2 has an external monitor port and an S-video (Super-video) port in case you want an alternative to the 14.1-inch TFT (thin-film transistor) display. Power users can take advantage of the external monitor port for use with Windows 98's dual-monitor support.

Design. The Si2 is a "full-figured" notebook that measures 1.65 inches high (when closed) x 12.2 inches wide x 9.6 inches deep, but surprisingly, it weighs just a manageable 7.1 pounds. Its austere outer shell is fairly solid. However, we didn't have to put much pressure on the lid panel to see considerable distortion on the display. We also were a little surprised to find our review unit had a tendency to rock toward its front-right corner. This is a small matter though, and is likely the result of the abuse review units get when they travel from place to place.

The LCD screen is particularly bright and clear, even at its lowest brightness setting, and it produces bold, full color. The speakers, which are situated along the notebook's front edge (this placement seems to be a growing trend), aren't very loud, but they sound OK other than a slight treble deficiency; overall, they were average. The Si2's keyboard felt a little shallow while typing and not quite as responsive as we'd like it to be. We also didn't care much for the arrangement of its cursor control keys along the right end of the standard keys. In some cases, manufacturers can get away with this placement if the BACKSPACE, SHIFT, and ENTER keys are wide enough, but this still caused us problems; we frequently found ourselves pressing the wrong keys.

The good news about the Si2's input features is that the touchpad beneath the keyboard is very nice, and if you prefer pointing sticks, WinBook has an excellent one. You can even disable the touchpad if you just want to use the pointing stick and the touchpad is getting in your way.

Performance. We were very impressed with the performance of the Si2 750. It cranked out the second best scores we've seen from a 750MHz Pentium III notebook, including a 153 in Internet Content Creation, a 134 in Office Productivity and an overall score of 142. Its MultimediaMark 99 scores were also quite impressive, including best-ever marks (in comparison to other 750MHz notebooks) in MPEG-1 Video Playback (1,692), Image Processing (2,649), and Audio Effects (2,450). The Si2 was able to earn an overall MultimediaMark score of 2,186. Windows 98 SE doesn't get along with our battery life test (BAPCo's SYSmark 98 for Battery Life), but WinBook generously estimates that the Si2 750 will run up to three hours on just one charge.

Final Word. Although we had some trouble getting used to its keyboard, we liked everything else about the Si2 750. WinBook put this notebook together well, gave it a nice display and a decent pair of speakers, added the convenience of dual pointing devices, and made it very fast. The WinBook Si2 750 performed better in several categories than our previous 750MHz record-holder (IBM's fantastic ThinkPad T20), and at $2,799, it costs about $1,300 less. GS

by Chris Trumble

Final Word: Nothing fancy, just a solid notebook that performs as well as notebooks that cost considerably more.

Features

Processor: 750MHz Pentium III
RAM: 128/256MB
Display: 14.1-inch TFT
Dimensions (inches): 1.6 x 12.2 x 9.6
Weight (pounds): 7.1
Hard Drive: 18GB
Optical Drive: 4X4X20X CD-RW
Connectivity: 56Kbps modem

Si2 750

$2,799
WinBook
(800) 254-7806
(614) 850-3000
http://www.winbook.com

UMAX AstraNET e3420

UMAX scanners rarely disappoint us. These reasonably priced machines are some of the best scanners on the market for home users. They feature excellent imaging capabilities, easy installation, and lots of helpful documentation. We've come to expect great performance from these scanners, which is why the AstraNET e3420's performance and image quality was so disappointing.

UMAX touts the 600dpi (dots per inch), 24-bit e3420 as an Internet scanner, and it certainly comes with its share of online extras. The package includes free Internet service from NetZero and WebLink software that allows you to store images directly to a Web page without having to save them to your hard drive first. UMAX gives you a one-year subscription for 50MB of space on ImageOL .com (http://www.imageol.com) to post your pictures. That may sound like a lot of space, but pictures can eat up the storage, so be sure to scan your Web images at a low 150dpi to save space.

Other accompanying software includes VistaScan 3.71, Presto! PageManager 4.2, Caere OmniPage 5.1 Light Edition, and Adobe PhotoDeluxe 3.0 Home Edition. The scanner also features four buttons that give you one-touch access to scanning, sending an image directly to a copier or custom application, and putting the scanner in a power-saving mode.

As with all UMAX scanners, there is ample documentation to guide you through scanner setup and software use, including a WebLink Quick Start Guide, a UMAX owners manual that covers everything from unpacking your scanner to using the online help guides, and the Color Scanner Quick Start Guide. You'll also find an electronic manual on the included CD-ROM.

Setting up the e3420 is simple. We just installed the software , rebooted and connected the scanner's USB plug.

The e3420 posted fast scan times that included a quick 15 seconds for a 150dpi index card-sized color-block image to only 2:21 for a large 600dpi color photograph. But quick scan times are only part of the overall scanning picture, and we expected better image quality from a UMAX scanner. Although the machine did a good job of reproducing rich and vibrant midrange colors, lighter and darker shades did not turn out as well as we would have liked. Details that appeared clear in the midrange sections of the picture tended to get lost in the glowing whitish colors and the muddied dark shades. Adjusting the settings using the e3420's scanning software did not improve the picture; lightening the dark background only increased the glowing effect on the lightest colors and vice versa.

The scanner also performed poorly on our grayscale test, recognizing only 18 separate shades of gray, which is far below our benchmark average of 27. However, the e3420 did a good job of reproducing crisp, clear, and clean black-and-white and text document images.

The $129 AstraNet e3420 is not the best UMAX scanner we've seen. Although it will work fine if all you want to do is scan images for the Web or an e-mail attachment, you can get a less-expensive scanner with better imaging capabilities to suit your needs. GS

by Lori Robison

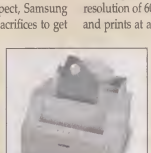
AstraNet e3420

$129
UMAX
(877) 885-7087
(510) 651-4000
http://www.umax.com/usa

Samsung ML-4500

If you've been itching for a laser printer for your home but were scared off by high prices, Samsung has come to your rescue. The company recently released the ML-4500 laser printer for the low, low price of $199.

As you might expect, Samsung had to make some sacrifices to get the printer down to this price level, but on balance, it's a pretty good product. The ML-4500 has a 35MHz processor, and it comes with 2MB of RAM, which you can't upgrade. The printer also is limited in its connection options; the only choice you have to hook it up to your computer is a parallel cable. This lack of a USB (Universal Serial Bus) connection may be a turn-off for some users.



On the plus side, the ML-4500 is a pretty small printer. It measures 9 inches high x 13 inches wide x 13.9 inches deep and weighs a mere 13.7 pounds. The ML-4500 also has a smallish paper tray capacity of 150 sheets, but that should be enough for home users.

This printer has a maximum resolution of 600dpi (dots per inch) and prints at a maximum of 8ppm (pages per minute), which is quite good considering the ML-4500's price tag. It does not support any fancy PDLs (page description languages) or PostScript, but it is compatible with the major Windows operating systems.

Our test results prove the ML-4500 packs a good punch. It printed the first page of our 10-page text file test in 20 seconds. That's a little slower than average, but not too bad. It printed the entire document in 1:27. The PowerPoint test results were similar: the ML-4500 printed the first page in :19 , and the entire three-page document in :33 .

The results from our Photoshop test were also impressive. The ML-4500 printed the image in only 26 seconds. Granted, this was at a resolution of 600dpi rather than our preferred resolution of 1,200dpi, but it's still respectable. In addition, the image quality was pretty good. In fact, the appearance of all the documents we printed was excellent. Fonts, charts, and graphics were crisp and clean.

If you've been dying for a laser printer but couldn't afford one, this is your product. It's not a top-of-the-line laser printer by any means, but dollar for dollar, it's very good indeed. GS

by Michael Sweet

ML-4500

$199
Samsung
(201) 229-4000
http://www.samsungusa.com

S3 Diamond Multimedia Viper II

Diamond Multimedia Viper II

$149
S3
(800) 468-5846
(408) 588-8000
http://www.s3.com

Get them while you can! S3 recently sold its graphics chip business to Via Technologies so it can concentrate on its digital media business. So, the Diamond Multimedia Viper II is probably the last graphics card you're going to see from S3.

The Viper II uses an S3 Savage 2000 graphics chip and comes with 32MB of SDRAM. It is a 4X/2X AGP card with a 350MHz RAMDAC (RAM digital-to-analog converter). The maximum resolution for the Viper II is 2,048 x 1,536, which is pretty typical for most graphics cards these days. Refresh rates are from 60Hz to 200Hz, and the Viper II has a 32-bit color depth. It also supports OpenGL and DirectX. You can use the Viper II with Windows 95, 98 (Win9x), Windows NT 4, and Windows 2000.

We tested the Viper II on a 600MHz Pentium III system with 128MB of SDRAM. We measured how well it handled 2-D applications using MadOnion's SYSmark 2000 test. Next we measured the frame rate the graphics card could sustain in Quake III, a popular 3-D game, while running in OpenGL mode. A frame rate of 30fps (frames per second) is necessary to keep images from looking choppy. Finally we ran the MadOnion 3Dmark2000 3-D graphics test. The higher the score, the better the graphics card is at processing 3-D data.

The Viper II proved to be a little on the weak side compared to many graphics cards we've seen this year. For example, the Viper II's overall SYSmark 2000 score was only 95, whereas most graphics cards approach 130. The Office Productivity score was a meager 93, and the Content Creation score was only 97. These are not good scores.

The Viper II also underperformed in our Quake III test. At a resolution of 800 x 600, the Viper II managed a frame rate of 40.6fps. That's good enough to keep images running fairly smooth, but not by much. The frame rate at 1,024 x 768 was 38.9, which isn't very impressive.

The 3Dmark score was also a bit low. The Viper II scored a 2,546. We've seen a couple of cards top 5,000 in this test, and most can at least surpass 3,000.

Final Word. The Viper II only costs $149, but we think it's worth spending a little extra money to get a better graphics card. This is a bargain-priced card for bargain-minded shoppers. GS

by Michael Sweet

IBM InfoPrint 21

IBM is one of the most highly respected names in the computer industry, but this company hardly limits itself to computers. It seems IBM makes a little bit of everything, including laser printers. One of its best is the IBM InfoPrint 21, which is a powerful printer for busy offices.

The InfoPrint 21 measures 16 inches high x 16.6 inches wide x 17.3 inches deep and weighs a hefty 57 pounds. The printer we tested had a parallel port connection and could be networked using an Ethernet connection, but other networking options are available. The InfoPrint 21 has a 100MHz IBM PowerPC 603e processor and 32MB of RAM, so this printer comes loaded with power. You can expand the memory all the way up to 256MB.

This printer won't give you much time to stand by the water cooler and chat because it can dish out 21 pages per minute. And, there is plenty of room to load those pages. The InfoPrint 21 has a main paper tray that stores 550 sheets, and it includes a 100-sheet auxiliary tray. This printer also has room for two optional 550-sheet trays, which gives the printer a maximum capacity of 1,750 pages. The Infoprint 21 has 600dpi (dots per inch) and 1,200dpi settings and supports PostScript 3, PCL 5e, and PCL 6.

The InfoPrint 21 made quick work of our tests, but you would expect that from a product that costs $1,500. It printed our 10-page text file in only 30 seconds and needed only nine seconds to print the first page. The InfoPrint 21 printed our Photoshop image in only 24 seconds with minimal banding. As for our three-page PowerPoint document, the printer needed only 15 seconds to print it.

The quality of the printed material was excellent across the board. Text was sharp, solid, and dark. The fonts looked great, and the graphics were pretty good for a laser printer.

The InfoPrint 21 is a big printer for big jobs. If you need to connect several people to one high-volume printer, the InfoPrint 21 is a good option, but it will cost you. GS

by Michael Sweet

InfoPrint 21

$1,518 (Ethernet-ready version)
IBM
(888) 746-7426
(404) 238-1234
http://www.ibm.com

Olympus D-490 Zoom

As much as there is to like about the two-megapixel D-490 Zoom digital camera from Olympus, there is nearly as much to question about aspects of its design, features, and bundled extras. This dichotomy ultimately leaves a bittersweet taste in our mouths.

At first glance, the D-490 Zoom appears to be another stellar offering from Olympus, which has a history of producing excellent models. The camera takes above-average images at resolutions as high as 1,600 x 1,200 pixels, includes a new QuickTime movie option to capture 15fps (frames per second) of video up to 60 seconds, and is travel-friendly. In addition, it has four image-quality settings (including an uncompressed TIFF [Tagged Image File Format] mode), four ISO (International Organization for Standardization) settings, programmable auto exposure, five white balance settings, a five-mode pop-up flash, DPOF (Digital Print Order Format) support, and a burst mode that takes 1.3 shots a second up to 45 shots in Standard Quality. That's a lot of camera for less than $400.

Unfortunately, Olympus omitted a USB (Universal Serial Bus) connection for transferring images, which forces users to use a much slower serial port alternative. That is almost inexcusable for a camera of this quality with two-megapixel shooting ability. In addition, Olympus doesn't include an A/C adapter and rechargeable batteries, the Olympus Camedia Master Utility software bundled is limited, and the camera ships with a smallish 8MB SmartMedia card that stores just 17 High Quality shots at 1,600 x 1,200 pixel resolution.

More frustrating are the vague menu icons and button labels. Many buttons have dual functions, and the menu isn't nearly as intuitive as it could be, so you'll need to keep the manual close for reference. In addition, turning off the camera requires sliding the lens cover over until it physically bumps against the lens, which could cause possible damage over the long term. Also, you can't immediately review shots without first shutting the lens cover and accessing the menu.

More positive are the camera's fast startup and recovery speeds and its quality lens (5.4mm-16.2mm, f2.8-f4.4), which has 3X optical zoom and 2X digital zoom and focuses 8 inches to 31 inches in macro mode and 31 inches to infinity normally. And, the camera's images are very good. Although colors were darker and muddier than we'd expect from an Olympus model, our images still rendered excellent crispness and focus in nearly every shot.

Initially, getting a two-megapixel model with options and images this good seems like a steal. However, there is no USB connection and you'll probably be shelling out for rechargeable batteries, an A/C adapter, and additional storage capacity. In the end though, the camera's good features narrowly outweigh the bad ones. GS

by Blaine Flamig

D-490 Zoom

$395
Olympus
(800) 347-4027
(631) 844-5000
http://www.olympusamerica.com

Micro Solutions backpack cd-rewriter 192100

There is no doubt that a CD-RW (CD-rewriteable) drive is one of the most convenient peripherals you can buy. And, if that CD-RW drive is a portable external unit, it's even more convenient, especially in a small-office setting. Micro Solution's backpack cd-rewriter 192100 fills this roll quite well.

The backpack cd-rewriter, which reads at 24X and rewrites at 4X, connects to your PC via either a USB (Universal Serial Bus) or parallel port connection. In addition, it has a 2MB buffer, which should help reduce errors when you're recording data to CD-R (CD-recordable) or CD-RW media. The backpack cd-rewriter can read the usual array of optical standards, including audio CDs, CD-R, CD-RW, Photo CD, and Video CD. The drive works with Windows 95, 98, NT 4, and 2000.

The backpack's test results were decent for an external drive, but keep in mind that internal drives have much faster data transfer rates. The data transfer rate for the backpack cd-rewriter was only 670KBps (kilobytes per second), which translates into a drive rating of 4.5X. That's a little on the slow side, but it will probably be sufficient for most tasks. Besides, the cd-rewriter's primary purpose is to record CDs, not read them.

The backpack cd-rewriter performed very well in our other tests. It had a respectable random-access time of 80ms (milliseconds), and a speedy full-stroke access time of 134ms. The drive also recorded data pretty quickly; it recorded 427MB of data to CD-RW in 17:30, which isn't bad at all. We also were pleased with the CD-R burning test results, in which the drive recorded 427MB of data to CD-R in only 8:02.

If you need a CD-RW drive that you can move from place to place, the backpack cd-rewriter is a good, fairly inexpensive choice. GS

by Michael Sweet

backpack cd-rewriter 192100

$269
Micro Solutions
(800) 890-7227
(815) 756-3411
http://www.micro-solutions.com

Microsoft Trackball Optical

Microsoft's Trackball Optical is one of two new trackballs Microsoft unveiled during Spring Comdex in Chicago in April. (The Trackball Explorer is the other.) Both units use Microsoft's IntelliEye optical sensors and DSPs (digital signal processors) instead of traditional moving parts to move your Windows pointer, and both are quite nice. The big difference between them (other than price) is that users manipulate the Explorer's big red ball with one or two fingers (the index and middle fingers seem most effective) while Optical users move through Windows primarily with their thumbs.

Trackball Optical has four buttons and a scrolling wheel, and you can configure each to perform one of nearly 50 different tasks, such as double-click and maximize/minimize. The two main buttons reside just to the left and right of the scrolling wheel, and there is another set just outside each of these. If you use Trackball Optical's standard configuration, the button to the left of the wheel is your left-click button and the one to the right is your right-click button. The other two are for moving back and forward through Windows or Web pages, and you can click the wheel like a fifth button to initiate AutoScroll. Changing these settings is simple with Microsoft's IntelliPoint 3.2 software, as is adjusting pointer speed, double-click speed, and other basic functions.

Trackball Optical's optical sensor takes 1,500 pictures each second, comparing each to the last and measuring how far you move the ball above it with the help of its continuous pattern of black dots. If the black dots on Optical's red ball look familiar, it may be because they are strikingly similar to the pattern found on all of Logitech's TrackMan Marble trackballs, which also use optical technology.

We liked the way Trackball Optical responded to our commands. It moved our pointer quickly and smoothly, and while everything about it is similar to the more expensive Trackball Explorer ($74.95), we found ourselves liking it quite a bit more. It's largely a matter of preference, of course, but we usually find that manipulating a trackball with our thumbs is simpler and more accurate than using other fingers. The beauty of this is that at $44.95, Trackball Optical is $30 cheaper than the Explorer, and although we like both units, we feel safe calling Trackball Optical our favorite trackball yet. Thumbs up! GS

by Chris Trumble

Trackball Optical
$44.95
Microsoft
(800) 426-9400
(425) 882-8080
http://www.microsoft.com

Palm m100

Not to be outdone by upstart Handspring, Palm has decided to refocus their efforts on the low-end market. The result is the first Palm unit not to include roman numerals in its name, the Palm m100.

The Palm m100 should pick up where the Palm IIIe left off. Designed mostly for a younger, more fashion-conscious crowd, the m100 sports smooth lines and small design. At 4.66 inches high x 3.12 inches wide x 0.72 inches deep, the m100's size is somewhere between the traditional Palm III and the sleek Palm V. Weighing just 4.4 ounces, the m100 is also very light and portable.

The Palm m100 makes you pay the price for its size with a very small display. The m100 also features the older 16MHz Dragonball processor as opposed to the newer 20MHz Dragonball featured in most of the new Palm units. Like most low-end palm-sized devices, the m100 comes with only 2MB of RAM, and the operating system (Palm OS 3.5) is not upgradeable.

To help sell the product to a younger crowd, the m100 features removable faceplates, similar to those found on the popular Nokia cellular phones. We have our doubts about how sturdy the faceplates are, but if you don't change them on a daily basis, they should be fine. Five different color faceplates are available from Palm for $19.95 each. The m100 ships with a black faceplate.

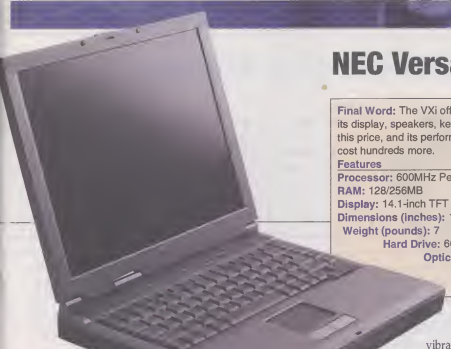
The new m100 also features several new software applications and a few noticeable omissions. One new application is Clock, which displays the date and time through a window in the screen cover. The second new application is Note Pad, which lets you make quick handwritten notes or sketches. The traditional Memo Pad is also included. Missing is the E-mail application, which means you won't be able to synchronize e-mail between your Palm and your desktop PC. The Expense application is also missing, but this is probably not a big loss considering Palm's target audience for this device.

The m100 is not a device for existing Palm users. Younger users, especially those on a budget, have a choice between the m100 and the 2MB Visor from Handspring. If you like the color and the ability to customize your palm-sized device, the m100 is for you. The Visor is a little more expensive but features a better expansion method (Springboard) than the clip-on m100 accessories that will be coming to market. The Visor isn't as pretty and is a little more expensive, but we like its Springboard technology and more readable display. You can buy the m100 for $149. GS

by Chad Denton

Palm m100
$149
Palm
(888) 956-7256
(408) 326-9000
http://www.palm.com

NEC Versa VXi 600



Final Word: The VXi offers considerable value for less than $2,500; we like its display, speakers, keyboard, and touchpad as much as any we've seen at this price, and its performance scores compare favorably with notebooks that cost hundreds more.

Features

Processor: 600MHz Pentium III
RAM: 128/256MB
Display: 14.1-inch TFT
Dimensions (inches): 1.6 x 12 x 9.9
Weight (pounds): 7
Hard Drive: 6GB
Optical Drive: 24X CD-ROM
Connectivity: Internal 56Kbps modem, 10/100Mbps network adapter

The Versa VXi 600 fills the full-sized value notebook slot in NEC's latest lineup by featuring an all-in-one design (simultaneous access to its hard drive, CD-ROM drive, and diskette drive), a 14.1-inch active-matrix display, and your choice of several Intel processors. Prices start at $1,899, but if you get one configured like the one we tested, you should expect to pay about $2,399.

Specifications. NEC offers the VXi with a wide range of processor options, from 500MHz Intel Celerons to 650MHz Pentium IIIs. Our test unit came with a 600MHz PIII and 128MB of RAM. If you're looking to save some cash, you can get it with 64MB; whatever you choose, you can expand the amount of RAM to 256MB. A 6GB hard drive is standard, as is an integrated 1.44MB diskette drive. Our unit also came with a 24X CD-ROM drive, but if you're a movie buff, you can upgrade that to a 6X DVD drive. Both drives reside on the unit's left edge, and a full complement of connectivity and peripheral ports reside at the rear, including an RJ-11 telephone jack for the VXi's internal 56Kbps (kilobits per second) modem.

You'll also find an IR (infrared) transmission port on the front of the notebook, and NEC includes a PCMCIA (Personal Computer Memory Card International Association) 10/100 Mbps (megabits per second) network adapter that fits into one of two PC Card slots on the right edge. Other standard items include a 14.4-volt Li-Ion (lithium-ion) battery and ATI's RAGE Mobility-M video control chipset with 4MB of SDRAM (synchronous dynamic RAM).

Design. The VXi doesn't stray far from NEC's traditional utilitarian look. Its dark plastic shell is plain and square, and although everything fits together nicely, it seems a little flexible in some areas. The most notable offender is its lid panel, which is soft enough to allow noticeable distortion of the LCD (liquid-crystal display) if you place a moderate amount of pressure on it.

However, the display itself is quite impressive for a value notebook. It is bright enough and produces sharp, vibrant colors that are easy on the eyes. In fact, the combination of its quality display and its great speakers may inspire some to upgrade to the DVD drive. The speakers are right at home on the unit's front edge where they take advantage of the acoustical benefits of your desktop while staying out of the way of your wrists while you type.

We have to admit we haven't always been crazy about NEC's input devices in the past, especially where keyboards are concerned, but the VXi passes our rigorous inspection with flying colors. It is spacious and well-arranged, and although the oft-dreaded row of cursor control keys ranges along the right end of the keyboard, we didn't find them to be a problem. This speaks to conscientious design, and our hats are off to NEC's notebook team, which also graced the notebook with a nice touchpad that is responsive and easy to use.

Performance. The VXi did a decent job running BAPCo's SYSmark 2000 performance benchmark software. It produced scores of 124 in Content Creation, 104 in Office Productivity, and an overall score of 112. These marks are better than we've seen in several 600MHz PIII units lately, so this unit continues NEC's tradition of squeezing every drop of performance out of mobile processors.

Its MultimediaMark 99 scores were better than comparable units, as well, and included a very impressive 2,059 in Image Processing and a 1,668 overall score. We couldn't get an accurate reading on the VXi's battery life because our test machine came with Windows 98 SE (Second Edition), which gives SYSmark for Battery Life 98 fits. NEC estimates an average battery life of 3 hours and 20 minutes.

Final Word. There isn't much of a downside to NEC's Versa VXi. It gave us better than average performance scores; has a full complement of quality components, including its display, speakers, keyboard, and touchpad; and aside from its pliable lid panel seems pretty tough. We would recommend purchasing a well-padded carrying case to give the display a little extra protection on the road, but other than that we think the VXi is a solid value at $2,399. GS

by Chris Trumble

Versa VXi 600

$2,399
NEC
(888) 863-2669
(650) 528-6000
http://www.nec-computers.com

Wacom Graphire

There's more than one way to navigate a graphical user interface, and digital tablets are a solid alternative to mice and trackballs. Digital tablets offer more precise control that can make a big difference to artists and graphic designers.

Wacom's Graphire line is the company's low-end consumer tablet; it comes with both a pen and a mouse. The tablet can distinguish between the two, letting you set separate preferences for each. Both tools are cordless and require no batteries to operate. The tablet tracks the movement of the mouse, so there's no need for a trackball.

The Graphire tablet has a fairly small active area of 4 inches x 5 inches, but this keeps the unit fairly compact in size so it fits easily onto your desk. The total dimensions of the tablet are 0.4 inches high x 8.2 inches wide x 8.4 inches long. Tablets are much more accurate than a typical mouse; the Graphire can detect 1,015 distinct points within a 1-inch line (or 1,015lpi [lines per inch]). This is lower than the 2,540lpi resolution offered by Wacom's higher-end Intuos line, but it should be sufficient for most home users. The tablet is also pressure sensitive; it can detect 512 different levels of pressure. This lets you vary shading and line thickness.

You can set the tablet to track the pen or mouse using one of two methods. In pen mode, each point corresponds to a point on the screen. Touching the pen to the lower-right corner of the pad will cause the pointer to jump to the lower-right corner of the display. In mouse mode, the tablet tracks the movement of the tool, not it's position on the tablet.

The unit also comes with a great bundle of software. Adobe Photoshop LE, Corel Painter Classic, ParaGraph PenOffice 2000 SE, Wacom Pen Tools, and additional utilities provide enough software for new users to experience everything the tablet has to offer.

The Graphire is a little expensive at $99.95, but for that price you get a highly programmable, worry-free input device. Because the Graphire mouse doesn't have any moving parts, it should last you a long time, and you'll enjoy the added accuracy and control it affords. If you enjoy working with images, the pen is really an invaluable tool. The Graphire is a great introductory unit for anyone not familiar with digital tablets. GS

by Chad Denton

Graphire

$99.95
Wacom
(800) 922-9348
(360) 896-9833
http://www.wacom.com

Intel Easy PC Camera

The recently released Easy PC Camera from Intel is one of the lowest-priced Web cams you're likely to find, but don't let the camera's inexpensive price tag fool you into thinking it isn't capable and worthy of your consideration. The camera may cost only $49, but it produces good quality, is attractively designed, and ships with a generous software package.

We've reviewed several Web cams from Intel, including the company's excellent Create & Share models. The Easy PC Camera doesn't produce the same kind of quality video flow and still digital shots as those models, but those cameras weren't aimed at the same type of consumer. The Easy PC Camera is specifically geared to newer users looking for an easy-to-use camera to get them started in the world of streaming video and audio.

To that end, the Easy PC is an excellent choice. Its USB (Universal Serial Bus) connection makes it a snap to connect to your PC and its software is incredibly intuitive and useful, letting you carry out such tasks as placing video calls over the Internet with Microsoft's NetMeeting. The bundled software also allows you to easily send video e-mail, play interactive games, and create photo galleries.

Using the software's friendly interface, we were able to snap still images at 640 x 480 pixels and preview video at 320 x 240 pixels without the need of a users manual or detailed instructions. Unlike most cameras on the market that can achieve a frame rate of 30fps (frames per second) at 320 x 230 pixels, the Easy PC Camera can do so only at 160 x 120. (A frame rate of 30fps is typically needed

to achieve smooth, television-like video.)

Overall, the camera's video and still shots are slightly above average. However, that's pretty impressive considering the camera's low price and the fact it uses a CMOS (complimentary metal-oxide semiconductor) image sensor instead of a CCD (charge-coupled device). After making a few manual adjustments through the camera's software, the camera produced images that were bright and sharp. We were less pleased with the grainy flat colors the camera rendered because they gave images an overall dull, lifeless feeling.

The camera's cream-colored body and dark blue trim also are appealing. Shaped much like a large flattened egg, the oval camera situates itself in a flat base that provides a solid foundation on the monitor top. The base allows the camera to rotate side to side and down, but not straight up. The camera's lens focuses 5cm to infinity.

The Easy PC Camera may be the best Web cam under $50 that we've seen. It doesn't have an integrated microphone or shutter button, but it does ship with a very good software package, features a solid design, and should provide new users a perfect solution for streaming live video and other functions. GS

by Blaine Flamig

Easy PC Camera

$49
Intel
(800) 628-8686
(408) 765-8080
http://www.intel.com/pccamera

Maxtor DiamondMax VL 40 40.9GB

We wrote this review just after Maxtor announced it was absorbing Quantum's hard drive business. This makes the short list of major desktop hard drive vendors even shorter: Maxtor, IBM, Seagate, Fujitsu, and Western Digital. One factor setting the stage for this merger is the fact that even though hard drive storage is probably more in demand than ever, the profit margins are extremely low. This means you can find great 20GB hard drives, such as IBM's Deskstar 40GV for $99 or less. However, we doubt that a future with only two or three hard drive suppliers would benefit the consumer more than would a competitive six-contestant race. Stay tuned.

Maxtor's VL 40 40.9GB hard drive is a "value line" model that is priced at $199. It has a ho-hum 5,400rpm (revolutions per minute) spindle speed, but its 2MB cache buffer is nice and fat. Unfortunately, even though the VL 40 can store 20GB of data on each of its two hard disk platters, which usually boosts read and write rates above drives with less density, its performance fell flat in our tests.

With a 20.2MBps average read rate and a 13.8MBps average write rate, it appeared to be a slower drive than the Maxtor VL 20 20.4GB we reviewed in October 1999. However, its maximum rates were a little perkier, reading at 28.4MBps and writing at 17.7MBps. The VL 40's 3.9% CPU overhead score was fashionably low, but its 15.4ms (millisecond) random access time was nothing to call the neighbors about.

This Maxtor's 250G (gravity) nonoperating 2ms shock tolerance is par for the value course, but we usually expect a 5,400rpm drive with only two platters to be a little tougher. Still, Maxtor says the VL 40 should last for at least 50,000 start/stop cycles. The drive's warranty period is unusual in that it extends for 39 months from the last date of the drive's production run. It also features Maxtor's two business-day advance replacement, "No Quibble" policy. 6S

by Marty Sems

DiamondMax VL 40 40.9GB

$199
Maxtor
(800) 262-9867
(408) 432-1700
http://www.maxtor.com

Lexmark Optra E312

Many small-office users want the quality and speed of a laser printer but don't want to pay through the nose for it, especially if that printer is only going to be used by three or four people. Lexmark's Optra E312 is a good choice for users who want laser printer quality, even for low-volume printing. It's a decent laser printer that costs less than $400.

The Optra E312 has a 67MHz processor and comes with 4MB of memory, expandable to 68MB. It prints up to 10 ppm (pages per minute) and has the usual USB and parallel port connections. It measures 8.8 inches high x 13.6 inches wide x 14.4 inches deep and weighs a rather lithe 16.5 pounds. The Optra E312 has a somewhat limited paper capacity of 150 sheets. Resolutions for the Optra E312 range from 300dpi to 1,200dpi. The Optra E312 works with a wide variety of operating systems, including Win9x, Win2000, WinNT 4, IBM OS/2 2.1 or higher, and various Unix and Linux platforms.

The Optra E312 did well in our tests, considering its price tag. Certainly there are far faster laser printers available, but they cost considerably more.

The Optra E312 printed the first page of a 10 page text file in 0:17, which is pretty good for a sub-$400 printer. It printed the entire document in 1:14, slightly over the 10ppm mark this printer is supposed to achieve.

We printed a 1.8MB Photoshop image in our next test. We couldn't print it at the maximum resolution, so we lowered the resolution to 600dpi. This time it worked, and the printer printed the image in only 0:36.

Finally we ran our PowerPoint test, and the Optra E312 did well. It printed the first page in 0:17 and the entire three-page document in only 0:29, which is a pretty good time in our opinion.

For the most part, the quality of the printed material was nice, if not great, and the fonts and text looked very crisp and dark. The graphics in the PowerPoint presentation looked especially nice, although there was some banding in the Photoshop image.

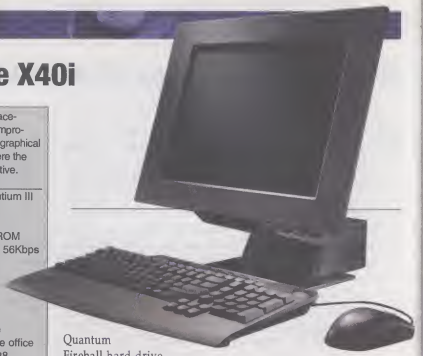
If you work in a small-office environment and need a printer to share with a couple of fellow office workers, the Optra E312 may be your ticket. 6S

by Michael Sweet

Optra E312

$399
Lexmark
(800) 539-6275
(606) 232-2249
http://www.lexmark.com

IBM NetVista All-In-One X40i



Final Word: Attractive, space-saving design means a compromise on expandability and graphical ability; good for offices where the right appearance is imperative.

Features

Processor: 600MHz Pentium III
RAM: 128MB
Hard Drive: 15GB
Optical Drive: 6X DVD-ROM
Connectivity: Combined 56Kbps modem and 10/100 Base-T Ethernet network interface card
Video Card: Integrated
Monitor: 15-inch LCD
Chassis Type: All-in-one
System Use: Home/home office
Video 2000 Features: 428

PC manufacturers have gone to great lengths in recent months to sculpt and craft desktop computers with designs that appeal to the changing tastes of users and for environments where appearance is important. In some cases, these sleeker designs have been attractive but omitted some components we prefer in a system. However, IBM's NetVista All-In-One X40i does a good job of providing style without sacrificing too much substance.

The X40i's streamlined, all-in-one design is visually appealing upon first sight, but IBM also used some clever touches to keep the design practical. One example is the descending tray that lowers from the bottom of the system's 15-inch LCD monitor with a push of a button. The tray harbors a 3.5-inch diskette drive and DVD-ROM drive and easily retracts when not in use to save space. The design means having to periodically push the keyboard aside to slip a disc or diskette into a drive, but it's a small inconvenience for the valuable space you ultimately gain.

IBM saves you even more desktop real estate by squeezing down the size of the motherboard and stuffing it into a small space on the monitor's backside. The tradeoff for saving space is the severe limitation of upgrading components down the road. Accessing the PCI (Peripheral Component Interconnect) slots is extremely difficult, and when you do get to them, you'll find there are only two slots, one of which is already occupied by a combined 56Kbps modem and 10/100Base-T Ethernet card. In addition, reaching the system's two RAM slots is difficult, there are no open bays, video and sound is integrated, and the included speakers are integrated and tiny.

On the more positive side, however, is the 128MB of SDRAM (synchronous dynamic RAM) that is already onboard, and you have the ability to upgrade that to 512MB via one open DIMM (dual in-line memory module) slot. There also are seven USB (Universal Serial Bus) ports, including two on the keyboard, two on the right side of the monitor, and three at the back. Also on the right side are microphone, speaker, and audio jacks, which give the system good connectivity but the potential for an unsightly mass of cables protruding from the monitor.

Inside the monitor lies a 600MHz Intel Pentium III processor with 133MHz bus speed and 256KB of L2 (Level 2) cache and 32KB of L1 (Level 1) cache. The processor is powerful enough for office productivity and Internet tasks, but it probably isn't suitable for those with demanding multimedia, gaming, and overall processing needs. IBM does offer the X40i with Pentium III or Celeron processors that range in speed from 533MHz to 800MHz. In addition, gamers are likely to notice a definite lag from the integrated video, which shares 16MB of memory with the system's overall SDRAM.

The X40i does offer some positive features that offset its limited processing power and expandability. For starters, there is a 15GB Quantum Fireball hard drive that provides good storage space; a Toshiba 6X DVD-ROM player; and the IBM NetVista 15-inch LCD monitor, which output exceptionally sharp, clear, and accurate colors in our testing and DVD playing using the movie "Armageddon." Although we noticed some very slight jaggies along the display's edges, the monitor's overall quality is definitely among the best we've seen in a 15-inch model. And despite the system's integrated audio, the speakers' performance wasn't nearly as bad as we expected it to be. However, we would suggest considering adding your own speakers and subwoofer if audio is an important factor to you.

To test the X40i, we ran BAPCo's SYSmark2000, which is a suite of 12 application workloads divided into two categories, Office Productivity and Internet Content Creation. We also ran MadOnion.com's Video2000 and 3Dmark2000 tests. Video2000 measures a system's video ability by assigning scores based in part on the processor, graphics card, memory, and motherboard. 3Dmark2000 evaluates a system's 3-D capabilities by using various tests for polygon counts, bump mapping, texture rendering speed, and image quality. In addition, we installed and played the 3-D game Quake III Arena and played several audio CDs.

As expected with a system using integrated video, the X40i's overall 3Dmark2000 score of 864 is on the low side, but the Video2000 marks were surprisingly good (1,736 overall) and compare favorably to 600MHz and 700MHz systems we've seen. The system's overall SYSmark2000 rating of 104 (based on an Office Productivity mark of 92 and Internet Content Creation score of 123) is about average for 600MHz systems we've reviewed.

Overall, the X40i's design and appearance are what stand out. The machine is a definite eye-grabber, and it saves space to boot. Much of its cost is associated with the LCD monitor, but its display quality is excellent. The system uses the Windows 98 operating system and ships with Lotus SmartSuite Millennium and Quicken 2000. If you can live with the limited expandability and graphical ability, the X40i makes for an attractive addition to high-trafficked work areas where there is a premium put on appearance. GS

by Blaine Flamig

NetVista All-In-One X40i

$2,099
IBM
(800) 426-4968
(914) 765-1900
http://www.ibm.com

Xerox DocuPrint M760

Xerox takes the lead in our $150 to $249 category of inkjet printers with the DocuPrint M760. It's a $199 printer with enough print quality to back up its claim to the gold medal.

Like its $149 brother, the M750, the M760 has a maximum resolution of 1,200 x 1,200 dpi (dots per inch). It also shares the M750's 150-page input tray capacity and has a rear bypass tray for special papers and banners. However, the extra $50 you spend on the M760 will get you a 4MB cache buffer instead of a 2MB one and a print engine that tested out between a half-page and a full page per minute (ppm) faster than the DocuPrint M750's.

The M760 comes with separate ink tanks for each color and Xerox's ink level-sensing InkLogic system. Instead of wasting the ink left in one or two tanks of a three-color cartridge, you can replace just the $12.49 cyan, magenta, or yellow tank that runs out. Each color ink tank will print up to 350 pages at 5% coverage, which works out to $37.47 for 350 pages at 15% coverage. For black cartridges, you can choose between a $22 400-page tank and a $30 700-page large tank. On a cost-per-page basis, these ink tanks aren't as economical as other printers we've reviewed, but the money you save by not wasting unused color inks could make up for it.

The Xerox DocuPrint M760 was two seconds slower than Lexmark's $180 Z52 while printing 10 pages of draft-quality text (6.52ppm), but it won every other race. We clocked it at 1.94ppm printing our PowerPoint presentation, 1.59ppm during our Word text with graphics document, and 0.21ppm (four minutes, 49 seconds) printing our full-page floral photograph on photo paper. We then tried the M760's eXpress setting, which is between its Normal print setting and Draft print setting, and found it cut print times by about a third without losing much print quality.

The M760's default (600 x 600dpi) and high-resolution text is bold and fairly sharp although we did notice we could smudge it a little even after a few days' drying time. In addition, we liked the DocuPrint M760's color graphics and photos quite a bit.

You can use the M760 with Windows 95, Windows 98, Windows NT4, Windows 2000 or Mac OS 8 and newer (Mac OS support will be available in Fall 2000). It comes with a one-year warranty with over-night exchange. You can even network this Xerox with the optional $149 CentreDirect external print server. All in all, the DocuPrint M760 is a great package from several angles. GS

by Marty Sems

DocuPrint M760

$199
Xerox
(800) 832-6979
(203) 968-3000
http://www.xerox.com

Seagate Cheetah 36LP ST336704LWV 36.7GB

We received a subtly different version of Seagate's Cheetah 36LP hard drive than one we'd seen before. It's a 36.7GB, 10,033RPM (revolutions per minute) drive that uses the Ultra160 SCSI (Small Computer Systems Interface), just like the previous 36LP, but with one internal difference.

The *V* on the end of this hard drive's model number, ST336704LWV, tells us that the drive has a bigger cache buffer than the ST336704LW model we tested in June. Its 16MB is pretty sizable for a hard drive cache, theoretically making the drive better suited for big files such as video (which also starts with *V*—get it?). Unfortunately, the Cheetah 36LP with a 4MB cache read and wrote most data faster than this model for some reason.

To be fair, this 36LP did beat the non-video-optimized model with a 27.4MBps (megabytes per second) maximum write data transfer rate. Still, its other scores trailed behind: a 34.6MBps average read rate, a 36.3MBps maximum read rate, and a 26MBps average write rate. Its average access time was the same as the "lesser" 36LP at 6.8ms (milliseconds), which is faster than all but two SCSI drives we've seen, yet its 5.9% CPU overhead figure means that it needs half a percentage point more of the host computer's attention to operate.

Before you get the impression that we're knocking this incarnation of the 36LP, you should realize that it's still a very hot number. After all, we noticed a brief read burst of 48.6MBps from the drive. In fact, if we counted this video-optimized 36LP as a separate model from the previous 36LP we tested, it would rank right behind it at fourth in our current list of the top 5 SCSI drives. We simply don't get why it turned out to be slower in so many tests.

Like its sibling, this 36LP has a 2ms shock tolerance of 200G (gravities), a 1.2 million hours MTBF (mean time between failures), and a five-year warranty. For more information on the Cheetah 36LP series, please check out our June 2000 review at http://www.smartcomputing.com. GS

by Marty Sems

Cheetah 36LP ST336704LWV 36.7GB

$720
Seagate
(877) 271-3285
(831) 438-6550
http://www.seagate.com

Kodak DC4800

Eastman Kodak's excellent new three-megapixel DC4800 does absolutely nothing to derail our opinion that Kodak makes some of the finest digital cameras available. In fact, the camera's outstanding images, ease of use, excellent manual controls, and sleek design only solidify our stance.

A trademark of Kodak's cameras is the above-average images they produce without sacrificing ease of use. The company outdid itself with the DC4800. It's easy enough for new users to take shots immediately without much trouble but has controls advanced users will also appreciate. In addition, it produces shots that are among the best, if not the best, we've seen from any consumer camera.

Capturing those shots is pretty easy, even when using the significant number of options available. Considering the camera has auto and manual exposure and white balance, a macro focus setting, three ISO equivalent settings, a diopter adjustment, flash synch, digital zoom, burst shooting to get four shots in four seconds, numerous special effects, and multi-spot, center-spot, and center-weighted metering, the camera shouldn't be this easy to operate. Thanks to intuitive icons, a mode dial, a 1.8-inch LCD (liquid-crystal display), four-directional navigational button, and a well-organized menu, though, it is.

The DC4800's design ventures into uncharted territory for the company. The features include a new rounded grip on the right side of the camera, a pop-up flash, and a protruding 3X optical zoom lens (28mm to 34mm, f/2.8-4.5). The lens accepts accessory lenses and filters, and it includes a 2X digital zoom feature.

In addition, the camera uses a welcome rechargeable lithium-ion battery that can recharge inside the camera using an AC adapter that also functions as a charger. The battery is proprietary, which means you won't be able to power the camera on optional batteries. We suggest buying an extra battery as soon as possible. Also different is the camera's elimination of a serial connection to transfer images to a computer. Instead, the camera only uses a faster USB (Universal Serial Bus) transfer method.

We're less excited about the layout of the top and back of the camera, which are crowded with a mode dial, shutter button, zoom lever, LCD, optical viewfinder, navigational menu, and display buttons. Plus, the optical viewfinder is placed right above the LCD, which means we always get our nose and fingerprints on it.

Those gripes aside, the camera's overall ability is excellent. There are three convenient preset f-stop settings on the mode dial, and images can be taken compressed or uncompressed at a top resolution of 2,160 x 1,440 pixels. Shots we took were extremely focused and bright. We were particularly pleased with our outdoor shots, which contained colors that nearly leaped off the monitor. Our only minor complaints revolve around the indoor macro shots we took. These were slightly blurry, and some images contained excessive color saturation at default settings.

At $750, the camera isn't cheap and may be more camera than many users need. However, we can't think of a consumer camera we've used recently that is flat-out better or one we'd like to have in our arsenal. The camera's image quality, controls, and ease of use are that good. GS

by Blaine Flamig

DC4800

$750
Eastman Kodak
(800) 235-6325
(716) 726-7260
http://www.kodak.com

Voyetra Santa Cruz

Voyetra Turtle Beach has just released a serious challenger to Creative Labs' powerful and popular Sound Blaster Live! line of sound cards. The Santa Cruz is a great-sounding and versatile sound card.

The Santa Cruz is a PCI sound card that uses the Cirrus Logic SoundFusion digital signal processor. It has a solid signal-to-noise ratio of 96dB (decibels) and a hardware polyphony of 64 voices. The maximum software polyphony is 1,024 voices. The Santa Cruz is compatible with the Windows 95/98 and NT 4 operating systems.

One of the greatest strengths of the Santa Cruz is its awesome API support. It supports all the most popular sound APIs, including DirectSound3D, A3D, EAX, and Sensaura. This will be especially beneficial to gamers.

Any computer product that has anything to do with sound has to be able to utilize MP3 in some way, and that's certainly true of the Santa Cruz sound card. It comes with the Audio Station 4 program, which is a software CD player/MP3 ripper combo. You can use the software to rip songs from your CDs in either the MP3 or Windows Media format. The Audio Station software is a decent, if somewhat basic, program. But hey, it's free.

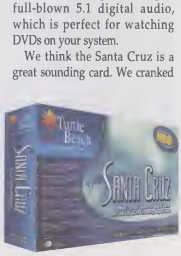
The Santa Cruz control panel lets you tweak the sound card's properties to your liking. It includes an equalizer and controls for many special sound effects, such as reverb and loudness. You can also simulate environmental effects, such as Small Room, Arena, and so on.

The other great strength of the Santa Cruz is its speaker support. It can handle any speaker configuration you like, analog or digital, from a basic two-speaker setup to full-blown 5.1 digital audio, which is perfect for watching DVDs on your system.

We think the Santa Cruz is a great sounding card. We cranked up the volume and listened to several audio tracks. We noticed nothing that compromised the quality of the sound. Every track sounded excellent. Our game test also went well. The ambient sounds in Half Life were especially good, and the 3-D audio was better than most.

Voyetra Turtle Beach is making a statement with the Santa Cruz. Creative Labs will have to work hard to top it. GS

by Michael Sweet



Santa Cruz

$99.95
Voyetra Turtle Beach
(800) 233-9377
(914) 966-0600
http://www.voyetra.com

Philips Vesta Fun PCVC665K

Philips has always put a creative twist on the way it designs its Web cams. Although those designs have been unique and eye-catching, we haven't always liked the stability they provided for the various cameras. The company's new Vesta Fun PCVC665K is a different story altogether. Not only does the camera give users a more solid design but it also pumps out pretty good image quality for less than $50.

Our last brush with a Web cam from Philips was the company's PCA646VC, which also was attractively priced. However, that model's design used a large egg-shaped camera that rested on a small stand, which resembled three small feet joined at the heels. The effect was completely frustrating because it left the camera free to constantly move around in the stand.

The Vesta Fun PCVC665K is a complete departure from that model. Shaped like a deck of playing cards, this smallish camera sits in a triangular stand that keeps it firmly in place on the monitor top. The base also lets the camera move up and down very well, but it has less side-to-side mobility. However, the camera's small size does let it function without being a distraction. In addition, it has some heft to it that keeps it in place even when its 6-foot USB (Universal Serial Bus) cord is nudged.

For a $49 camera, this unit performs surprisingly well. It takes still shots at 640 x 480 pixels; it also grabs 10fps (frames per second) at that resolution, but grabs a smoother 30fps at 320 x 240 pixels. Additional resolutions in various formats for grabbing video include 352 x 288 pixels, 240 x 180 pixels, 176 x 144 pixels, 160 x 120 pixels, and 128 x 96 pixels. (Typically, 30fps are needed to achieve smooth video motion.)

The camera has an f2.0 lens with a manual focus ring that protrudes slightly from the square main body. The camera uses a CMOS (complementary metal-oxide semiconductor) image sensor, which helps keep the unit's price down. CMOS sensors are generally thought to produce lesser-quality images than CCD (charge-coupled device) image sensors, but the still images we shot with the camera were bright and clear. However, they lacked some focus and sharpness. In addition, the video the camera rendered featured colors that were duller and grainier than other cameras we've seen.

We were more pleased with the bundled software, which features a program for streaming live audio and video to the Camarades Web site (http://www.camarades.com). Here, family members, friends, and others can sign on to view your video in real-time. Additional software includes Microsoft's NetMeeting, VideoLink Mail, interactive games, and Ulead Photo Explorer for creating Web pages.

At $49, we didn't expect the Vesta Fun to offer up all the features and quality typically found in a more expensive Web cam, but we were pleasantly surprised. In addition, the Vesta Fun's design is a big improvement over previous Philips' models, and the camera's low price and quality should get the attention of many users. GS

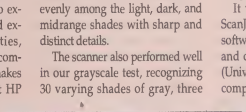
by Blaine Flamig

Vesta Fun PCVC665K

$49
Philips Electronics
(888) 262-2673
(770) 821-2400
http://www.philips.com

HP ScanJet 5370Cse

Hewlett-Packard has built a reputation for quality scanners and the ScanJet 5370Cse is no exception. In fact, its all-around excellent imaging capabilities, secondary light source, and comprehensive software bundle makes the 5370Cse one of the best HP scanners we've reviewed.



The ScanJet is 4.1 x 11.9 x 19.9 (HxWxD), and it weighs 10.7 pounds. Designed for the small office/home office, the ScanJet has a top optical resolution of 1,200dpi (dots per inch) and 36-bit color depth (42-bit with software enhancement). It also features four buttons for easy scanning to your PC, a printer, fax, or e-mail program.

But what really sets the 5370Cse apart is its superb image quality. The machine's accompanying transparency adapter, for example, features a secondary light source that helps reproduce some of the smoothest and cleanest negatives and slides we've ever seen from a flatbed scanner. In addition, scanned photographs appear with rich and vibrant color that blends evenly among the light, dark, and midrange shades with sharp and distinct details.

The scanner also performed well in our grayscale test, recognizing 30 varying shades of gray, three above our 27-shade benchmark average. Our scanned black-and-white and text-document test images also appeared very crisp and clean. The only downside to the 5370Cse was its scan times, which ran as long as 16:51 for a 1,200dpi color photograph.

We also liked the software bundle that came with the 5370Cse. Using the HP scanning software, you can scan in multiple pages as one file that you can then attach to an e-mail message or send to a fax machine. Other included titles let you create Web pages, edit your images, and organize documents.

It was easy to set up the HP ScanJet 5370Cse. We installed the software, rebooted our computer, and connected the scanner's USB (Universal Serial Bus) cable to our computer. Be aware that loading all the included software on to your computer will eat up 405MB of hard drive space, so you may just want to install only the programs you know you will use regularly.

All in all, the $299 5370Cse is an excellent scanner for any small- or home-office user or anyone who wants quality image capabilities for a variety of scanning tasks. GS

by Lori Robison

ScanJet 5370Cse

$299
Hewlett-Packard
(800) 752-0900
(650) 857-1501
http://www.hp.com

NEC SuperScript 1450N

If you need a small office laser printer but don't want to pay big office prices, consider the NEC SuperScript 1450N laser printer. It doesn't carry a fat price tag, and it's definitely slower than a $1,000 laser printer, but it does its job well.

The SuperScript 1450N prints 12ppm (pages per minute) and runs on a 66MHz PowerPC RISC processor. It comes with 16MB of RAM, which can be expanded to 80MB. This printer has a little less memory capacity than many printers we've seen, but it should be enough for a small office.

The SuperScript 1450N measures 10.24 inches high x 17.85 inches wide x 15.09 inches deep and weighs 24.2 pounds. You can connect to the printer with either a parallel cable or a USB cable, or you can connect through the 10/100Base-TX NIC (network interface card).

This printer is a little light on paper capacity, holding 550 sheets in the main tray and an additional 100 sheets in an auxiliary "multi-purpose" tray. You can add a second tray that holds an additional 550 sheets of paper, which brings the total paper capacity of the printer to a more reasonable 1,200 sheets.

The SuperScript 1450N has a minimum resolution of 300dpi, a default resolution of 600dpi, and a maximum resolution of 1,200dpi. It supports PCL 6 and includes 136 PostScript fonts. This printer is compatible with the Windows 9x, Windows NT 4, Windows 2000, and MacOS 8.6 or higher operating systems.

The SuperScript 1450N was just a little slow coming out of the gate in our first test. It printed the first page of our 10 page text file in 0:14, which isn't a bad score, but not great either. It printed the entire 10 page file in 0:59, which is slightly under the 12ppm mark this printer is supposed to achieve. The SuperScript 1450N really rocked in our next test, though. It printed the Adobe PhotoShop image in only 0:21, which is a very impressive time. The PowerPoint test also went well. The SuperScript 1450N printed the first page in 0:15, and the entire three-page document in only 0:24.

The quality of the printed material was especially good. The photograph was very crisp and clear, and we saw almost no discernable banding during out tests. The fonts looked dark and clear, and the graphics in the Power-Point document were also quite clean. Everything we printed with this laser printer looked great.

The SuperScript 1450N may have been a little slow in one of our tests, but its overall speed was pretty good, and there is no arguing with the quality of the print jobs. We recommend the SuperScript 1450N for those who want a solid small-office laser printer for a relatively low price. GS

by Michael Sweet

SuperScript 1450N

$699
NEC
(800) 632-4636
http://www.nectech.com

VTech Phusion

VTech's new Phusion PDA is by no means a serious tool for today's mobile professionals. Rather, it's a serious toy for the mobile professionals of tomorrow. Although this PDA for kids has many gimmicks, such as the built-in digital camera, the Phusion also includes a variety of useful applications.

The Phusion is one of the largest palm-sized devices available: It weighs nearly 10 ounces and measures 6.10 inches high x 3.43 inches wide x 0.87 inches thick. A brightly colored yellow and blue casing provides a measure of protection against the abuse that most kids will subject this device to.

The most notable feature of the Phusion is the built-in digital camera mounted on the top of the device. Although the camera adds significantly to the size of the device, it's just the kind of thing a kid would enjoy. Of course, the pictures are low quality (160 x 160 pixels) and in grayscale (four shades of gray on the device and 256 on a PC). Included desktop software lets you convert and upload pictures from your PC, but images larger than 160 x 160 pixels won't display properly on the device.

The Phusion does have an impressive array of software. More than 30 different software applications provide everything from traditional personal information management to learning software and entertainment software. The Phusion also includes software that lets kids use their digital pictures in a variety of different ways. This software bundle is important since the Phusion's proprietary OS means you'll probably see little, if any, additional software.

Although we like the camera and the software package, we feel the unit is unnecessarily complicated. Because the display is not touch-sensitive, you have to navigate the device using the three buttons and the directional pad at the bottom of the device. The unit also doesn't feature handwriting recognition software, so you must enter text using the touch-sensitive keyboard below the display. This makes entering text a very slow process. The device is also difficult to synchronize with a desktop PC.

Overall, we feel these complications significantly detract from the unit's usability. Although we have no doubt that kids are smart enough to use the device, we do doubt they'll be patient enough to use all of the device's features to their fullest potential. Although Phusion is priced at $119, it's still an expensive toy. We'd love to recommend the Phusion for its software bundle and digital camera, but our usability concerns are too great. GS

by Chad Denton

Phusion

$119
VTech
(800) 521-2010
(847) 215-9700
http://www.myphusion.com

Toshiba Satellite 2775XDVD

If you're looking for a good notebook but you can't spend that much, it's pretty hard to beat Toshiba's inexpensive line of Satellite notebooks. For example, the 2775XDVD we recently looked at includes a 14.1-inch active-matrix display, a 12GB hard drive, and an 8X DVD-ROM drive for an estimated street price of $2,199. And thanks to its Pentium III power, you won't have to sacrifice performance to get such toys.

Specifications. Our full-sized 2775XDVD came toting a 650MHz Intel Pentium III mobile processor and 64MB of PC100 SDRAM (synchronous dynamic RAM) that conforms to Intel's PC100 standard. You can add 128MB more should you need to, for 192MB of total system memory. In addition, the 2775XDVD is loaded with an impressive triumvirate of drives, including a spacious 12GB hard drive, an integrated 1.44MB diskette drive, and an integrated 8X DVD drive. Its diskette and DVD drives occupy most of the notebook's front edge along with a set of CD player controls. Having both drives built into the system makes the 2775XDVD weigh a bit more than notebooks with external or swappable drives, but it ensures constant access to the storage device of your choice.

A pair of PC Card slots resides on its right edge, along with a set of audio input/output jacks, a volume control dial, and an RJ-11 phone port for its internal 56Kbps modem. A 10.8-volt Li-Ion (lithium-ion) battery keeps the notebook active when it's away from AC power, and an S2 Savage IX video chipset with 8MB of video memory drives its 14.1-inch TFT (thin-film transistor) display.

Design. The 2775XDVD is a good-looking notebook with a sturdy outer shell and a magnesium-alloy panel that covers most of its lid. In addition to providing an attractive accent, the magnesium plate provides increased protection for the notebook's display while keeping the overall weight of the unit lighter than 7 pounds despite its considerable size. At 1.9 inches high (with the lid closed) x 12.4 inches wide x 10.3 inches deep, there aren't many notebooks bigger, but at just 6.7 pounds, there are plenty that are heavier.

The display is a hair dimmer than we'd like even at its highest brightness setting, but it is very sharp and easy to read. The speakers above the keyboard are nearly perfect; they produce more volume than you will probably ever need, and although they distort a bit at three-fourths volume and higher, they are crystal clear below that and have a full, warm sound. Even though the look of the speakers isn't as important as how they sound, Toshiba put some racy grills on them that really add to the 2775XDVD's overall appearance.

The keyboard, which is directly beneath the speakers, is better than average and has large easy-to-find keys; in fact, the only problem we had with the keyboard was that the keys were a little too sensitive. We found ourselves frequently typing unwanted characters until we got smart and started using proper typing hand posture. The AccuPoint II pointing stick in the middle of the keyboard is excellent as usual, as are Toshiba's distinctive over-and-under pointing stick buttons arrayed just below the keyboard.

Performance. We got the SYSmark 2000 performance scores we expected from the 2775XDVD, including a 115 in Content Creation, a 107 in Office Productivity, and a 110 overall score. It fared equally well with Multimedia-Mark 99, garnering scores of 2,117 and 2,110, respectively, in Image Processing and Audio Effects, and a healthy 1,850 overall. We've reviewed 650MHz Pentium III notebooks that put up higher numbers, but not many. The multimedia scores in particular didn't surprise us too much, especially given the 2775XDVD's lavish treatment of DVD movies. It plays them smoothly, without pixelization or hesitation, and thanks to its speakers, the audio is as enjoyable as the video. And unless you pop in an endless Kevin Costner film, you'll be able to watch the whole thing if Toshiba's claim of 2 hours and 18 minutes of battery life is accurate.

Final Word. You won't find many notebooks this good for $2,199. The 2775XDVD is big but surprisingly light, and it comes with a long list of excellent features. Its multimedia capabilities (especially its DVD movie playback) rival those of notebooks that cost a thousand dollars more, and we were happy with its performance scores. Toshiba claims there are 24,192 configurations of its various notebook models, but we're pretty sure you won't have to look at too many to know you like this one. GS

by Chris Trumble

Final Word: You won't find many notebooks this good for $2,199; the 2775XDVD is big but surprisingly light, and it comes with a long list of excellent features, including a sharp display, outstanding speakers, a good keyboard, and Toshiba's AccuPoint II pointing stick.

Features

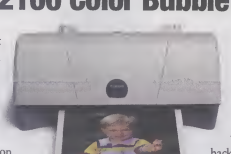
Processor: 650MHz Pentium III
RAM: 64/192MB
Display: 14.1-inch TFT
Dimensions (inches): 1.9 x 12.4 x 10.3
Weight (pounds): 6.7
Hard Drive: 12GB
Optical Drive: 8X DVD-ROM
Connectivity: 56Kbps modem

Satellite 2775XDVD

$2,199
Toshiba
(800) 457-7777
(949) 583-3000
http://www.csd.toshiba.com

Canon BJC-2100 Color Bubble Jet Printer

One of the best things about the $99 BJC-2100 from Canon is that the company offers a $50 rebate on it. As a $49 printer, the BJC-2100 is a steal. It offers very good text at its 720 x 360dpi default resolution and passable photos on photographic paper. However, as the $50 discount is a rebate and not an official price reduction, we're forced to treat the BJC-2100 as a $99 printer, which puts it up against some serious competitors, such as Epson's Stylus Color 670 and Lexmark's Z32 Color Jetprinter.



We tested this Canon on an IBM PC with a 667MHz Pentium III, 192MB of RAM, and Windows 98 SE. The BJC-2100 comes with both parallel and USB (Universal Serial Bus) connections. We hooked it up to the test PC with a parallel cable, following the included quick start guide. The users manual is on CD, along with American Greetings' Creatacard SE.

This low-cost Canon gave us some fair speeds: 2.40ppm (pages per minute) in our 10-page, draft-quality text test (but we didn't like the results), 1ppm in our PowerPoint presentation, and 0.7ppm for our Word document with both text and color graphics. Its photographs printed at 0.10ppm on both normal and photographic paper.

The BJC-2100 edges out the Epson 670 in text sharpness and top speed, but the 670 leaves it behind in every other competition. Lexmark's Z32 only gives up photo printing speed to the Canon. Distinct banding and eye-twisting dithering patterns plague the Canon's color graphics in Word and PowerPoint. However, if all you need is a cheap printer for the occasional letter or photograph, the BJC-2100 could be just the thing.

Canon backs the BJC-2100 with a one-year warranty. It's compatible with Win95/98/NT4/2000 and Mac OS 8.1 and higher. Both the black and color ink tanks ($9 and $22, respectively) fit inside a single printhead. The printhead, which comes as a $53 replacement assembly with tanks included, won't need to be replaced as often as the tanks themselves. Working backward from Canon's provided costs per page, we estimate the number of prints you'll get from the black tank at 225 and 137 pages from the color tank. This means that the BJC-2100 should be a very cost-effective text printer, but any color documents won't be cheap.

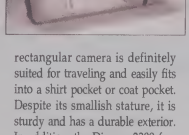
We've read too many letters about broken promises to endorse any rebate offer, but Canon is pretty trustworthy. All we can say is that the BJC-2100 is a good deal at $49. 6S

by Marty Sems

BJC-2100 Color Bubble Jet Printer
$99
Canon
(800) 423-2366; (714) 438-3000
http://www.ccsi.canon.com

Minolta Dimage 2300

Minolta's Dimage 2300 digital camera may lack the advanced features other cameras in the 2-megapixel class possess, but it does capture fine images and is one of the easiest-to-use models you'll find in this image-quality range.



However, we were disappointed that Minolta omitted advanced manual functions. With limited special effects and no options for setting exposure, focus, and metering, advanced users are probably going to want more than this model offers. Newer users who need a camera that produces above-average prints without needing to continually consult a manual are more apt to find the Dimage 2300 attractive.

Although the menu is completely text-driven, it's extremely easy to navigate thanks to the navigational and menu buttons on the camera's backside. We configured the camera and were snapping shots within minutes of taking the Dimage 2300 out of the box.

Much of the Dimage 2300's ease-of-use stems from its appearance, which is very similar to the point-and-shoot film cameras most users are already comfortable with. Slightly larger than your palm, the rectangular camera is definitely suited for traveling and easily fits into a shirt pocket or coat pocket. Despite its smallish stature, it is sturdy and has a durable exterior. In addition, the Dimage 2300 features a nice built-in lens cover.

The camera captures shots with a 2.3-million CCD (charge-coupled device) at resolutions of 1,792 x 1,200 pixels and 800 x 600 pixels at quality settings of Super Fine, Fine, Standard, and Economy. The camera stores one to 47 images on an included 8MB CompactFlash card.

The Dimage 2300 is equipped with an autofocus lens (38mm, f/3.0-f/13.0) that has a focus range of about 2 feet to infinity and a macro setting that focuses as close as 12 inches. The lens is located on the extreme right side of the camera's front, which, unfortunately, makes it easy to cover with the fingers on your left hand. It includes 2X digital zoom and 3X playback zoom, but not optical zoom, which is preferable. The camera also is limited to automatic exposure, center-weighted metering, and automatic white balance with manual settings for daylight, tungsten, and fluorescent lighting.

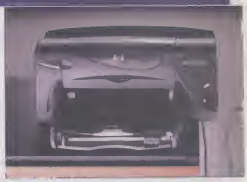
The camera does include a five-mode flash unit, a 1.8-inch LCD, optional remote control, serial and USB transfer methods, and a burst mode that captures 2fps (frames per second) up to four frames in the Fine mode at a resolution of 1,792 x 1,200 pixels. The camera operates on four AA alkaline batteries or four rechargeable nickel-cadmium or NiMH (nickel-metal hydride) batteries. An A/C adapter isn't included, but Adobe PhotoShop LE software is.

The Dimage 2300 ultimately amounts to a very good entry-level camera that offers up good image quality and a short learning curve. The camera's advanced options won't knock you over, but its ease-of-use should appeal to newer users. 6S

by Blaine Flamig

Dimage 2300
$385
Minolta
(800) 528-4767; (201) 825-4000
http://www.minoltausa.com

HP PhotoSmart 1218



Hewlett-Packard knows you want features in your inkjet printer. That's why the company packed its PhotoSmart 1218 inkjet printer with such goodies as an infrared port that can receive wireless print jobs, an automatic two-sided printing (or duplexing) module, and slots that can print photos from your digital camera's Microdrive or CompactFlash and SmartMedia memory cards without bothering with your computer. It also has the fastest top speed of any printer we've tested so far: 7.89ppm (pages per minute) when printing draft-quality text. Unfortunately, HP forgot to make sure this $499 wonder's prints were impeccable.

In other particulars, the 1218 has USB (Universal Serial Bus) and parallel ports, as well as a handy 4- x 6-inch photo paper tray that lets you print photos without removing your regular letter-sized paper from its 100-sheet input tray. As with many HP printers, you can network this PhotoSmart using the optional JetDirect print server, which starts at $144. The 1218 has a default resolution of 600 x 600dpi (dots per inch), but it can hit 2,400 x 1,200dpi in an "alternative photo mode."

This PhotoSmart is a very fast printer; in fact, the 1218 took only 3:29 to print a full-page photo on plain paper (0.29ppm; prints on photo paper took 2-3 times as long). Perhaps the 1218's gigantic 16MB buffer helped expedite things. Its Microsoft PowerPoint and Word test results also were very good at 2.25ppm and 1.87ppm.

Unfortunately, we noted some faint banding in the Word graphics, grainy aquamarine solid colors in our PowerPoint charts, and spotty performance wherever the 1218 printed areas of solid black. Its full-page photo images should satisfy most users, but we have other printers' photos close at hand so we can make detailed comparisons. Even at $499, this HP just doesn't produce the same detail and sheer liveliness as an Epson printer.

The PhotoSmart 1218 has a one-year warranty and uses a $30 833-page black ink cartridge and a $60 970-page color tank. HP says the color cartridge is already optimized for photo printing, so you won't need to worry about an optional photo ink cartridge. The 1218's photos are good enough to bear out this claim, and you can't argue against its meteoric speed and awesome feature list. GS

by Marty Sems

PhotoSmart 1218
$499
Hewlett-Packard
(800) 752-0900
(650) 857-1501
http://www.hp.com

Olympus Camedia P-400

Before inkjet printers improved so much, the best way to print exquisite digital photos was with a dye sublimation printer, which used heat to transfer ink from colored ribbons to the paper. The resulting photos can be indistinguishable from a traditional print.

The drawback to "dye-subs" is high cost. However, Olympus hopes that its new $999 Camedia P-400 is priced low enough to attract digital camera owners.

The P-400 can print more than 16 million colors (called 24-bit color). It's a 7.7-megapixel printer, which works out to a resolution of 314 x 320dpi (dots per inch). This would be considered low resolution in an inkjet, but it's just fine for a dye-sub to produce smooth images and great detail.

Conveniently, you can stick your digital camera's SmartMedia or PC Card memory device (or CompactFlash or Memory Stick with an appropriate adapter) into the P-400's slots and print your photos without using a computer. It has simple buttons and a dial next to a LCD (liquid-crystal display) menu screen that also displays rudimentary images of the pictures on your memory card. You can rotate, crop, and date your pictures and apply effects such as sepia tone to them.

Of course, you can also control the P-400 from a PC or Macintosh using a parallel or USB (Universal Serial Bus) cable as appropriate. It carries a one-year warranty.

The P-400's replacement ribbons should print 50 full-page photos for $44.95. Olympus claims each 8- x 10-inch print should print in 90 seconds and will cost about $1.90, including ink and paper, which is on par with today's inkjets. Ours took 2:13 to 2:30, but that's still faster than an inkjet. The P-400's black text on photo paper was extremely sharp, and its photos were high quality.

Three things keep us from recommending this printer to most users. For one, you can't use regular 8.5- x 11-inch paper with it. The P-400's input tray is only wide enough to accept A4-sized paper, which is skinnier and longer than letter-sized paper. Furthermore, Olympus's standard A4 dye-sublimation paper costs almost a dollar a page ($24.95 for 25 sheets).

Secondly, although Olympus bills the P-400 as a portable printer for quick on-site prints, it weighs 26 pounds.

Finally, the P-400's photos are very nice, but we think that Epson's $249 Stylus Photo 870's look better. You can also print more than just photographs on an inkjet. GS

by Marty Sems

Camedia P-400
$999
Olympus
(800) 622-6372
http://www.olympus.com

Gateway Solo 1150cl

The quality of value-priced notebooks has improved considerably in the past year or so, and Gateway's Solo 1150cl is a prime example. Priced at $1,399, it features a quality active-matrix display, a Celeron processor, and a simple yet functional design. It's also the first notebook we've reviewed without serial or parallel ports. Instead, it sports one USB (Universal Serial Bus) port on its right edge and another at the rear. This is a great move because USB peripherals for notebooks are becoming more common.

Specifications. The 1150cl comes with a 550MHz version of Intel's mobile Celeron processor and 64MB of RAM that you can upgrade to 192MB. A 6GB IBM hard drive is also standard, as are the 1150's fully integrated 24X CD-ROM and 1.44MB diskette drives, which offer full-time simultaneous access. The Silicon Motion 3DM video controller with 4MB of SGRAM (synchronous graphics RAM) supports its 12.1-inch TFT (thin film transistor) display, and the 9.6-volt NiMH (nickel-metal hydride) battery keeps everything running when you're away from an outlet. The 1150's internal 56Kbps (kilobits per second) modem handles the notebook's connectivity needs.

Design. At 2.17 inches high x 13.28 inches wide x 10.5 inches deep, the 1150 is a good-sized notebook, but its rounded clamshell shape makes it look smaller than it really is. Combined with the rounded rubber inlays in the lid (which were a little loose), the 1150's shape makes it look quite a bit like an Apple PowerBook. In fact, if it weren't for the familiar cow-spotted box logo in the center of the lid, you'd probably mistake it for one.

In any event, the 1150 is an attractive unit with a case that feels solid in all the places it needs to be. In addition, its active-matrix display is one of the sharpest and brightest 12.1-inchers we've seen. The speakers also are impressive, as they provide sufficient volume and exceptional clarity and warmth. Our only concern is their location in the wrist rest because they'll be located directly beneath many users' wrists.

The 1150's keyboard would be nearly perfect if it weren't for the row of page navigation keys (HOME, END, etc.) located along its right edge. These keys tend to get in the way and cause typos until you get used to them, which can take some time and be quite frustrating. The touchpad below is as good as any we've seen, and aside from elevating the buttons a hair above the wrist rest, we wouldn't change a thing.

Performance. The 550MHz Celeron produced SYSmark 2000 performance scores that were modest but reasonable, including an 83 in Internet Content Creation, a 75 in Office Productivity, and an overall score of 78. Its Multi-mediaMark 99 scores also were respectable but unremarkable, including a 1,790 for Audio Effects, a 1,743 for Image Processing, and an overall score of 1,449. Unfortunately, we weren't able to test the 1150's battery life because our test software is presently incompatible with Windows Millennium Edition.

Final Word. Considering Gateway offers the same notebook with a slower processor, 32MB less RAM, a smaller hard drive, and an HPA (high-performance addressing) passive-matrix display for just $200 less (the 1150cs), we think the 1150cl is a terrific buy. It's not a world-class performer, but given the quality of its display, speakers, and input devices, a few benchmark points are a small compromise to make for a $1,399 notebook that is this nice.

If you have invested a great deal of money on serial or parallel peripheral devices in the past, the 1150's USB-only design may be a sticking point unless you're willing to spend a little more for some serial- or parallel-to-USB port adapters. Besides that issue, we recommend the Solo 1150cl wholeheartedly. GS

by Chris Trumble

Solo 1150cl

$1,399
Gateway
(800) 846-4208
(858) 799-3401
http://www.gateway.com

Final Word: Not a monster performer, but it does quite well for its price point; this Solo is one of our favorites, and at $1,399, it won't break the bank

Features:

Processor: 550MHz Celeron
RAM: 64MB (upgradeable to 192MB)
Display: 12.1-inch TFT
Dimensions (inches): 2.17 (h) x 13.28 (w) x 10.5 (d)
Weight (pounds): 6.71
Hard Drive: 6GB
Optical Drive: 24X CD-ROM
Connectivity: 56Kbps modem

MAG InnoVision 810FD

MAG InnoVision touts its 810FD monitor as a unit for desktop publishing and high-end graphics users, and our tests confirm that if you're looking for a display for professional imaging tasks, this 19-inch monitor will not disappoint.

The solid, 48.4-pound CRT display includes a dial on the front so you can easily adjust the many OSD (on-screen display) settings, including brightness, contrast, and focus, as well as the screen's size, shape, and position. Other advanced OSD features let you adjust the moiré, color temperature, degauss, and more. We liked the video mode button that is also on the front of the unit. This button lets you adjust the overall hue of the 810FD's picture to make the on-screen images appear warmer, a little larger, and more vivid.

In addition to 18 inches of viewing area and a nice 0.24 dot pitch, the 810FD features a 85Hz maximum refresh rate and is capable of displaying resolutions as high as 1,800 x 1,440dpi (dots per inch). For our tests, though, we could only set our screen resolution as high as 1,600 x 1,200dpi, as our video card drivers did not support the MAG monitor's maximum resolution settings.

Connecting the 810FD, which ships with a 15-pin SVGA cable, to our test system was simple. If you need help during installation, just check the accompanying User's Guide for assistance.

Images displayed on the MAG monitor, while not perfect, where pretty close. We did notice some fuzziness around black-and-white images during testing, and images also looked a little fuzzy at the system's maximum resolution settings. In addition, the monitor's color registration was just a tad off, and we noticed some minor flickering in the corners of the screen during our screen regulation tests.

These problems were minor, however, especially compared to the 810FD's overall test results and image display capabilities. Focus, resolution, and linearity were all excellent, as were the monitor's grayscale and color displays. Photographs appeared very rich, vibrant, and detailed.

For $549, the 19-inch MAG InnoVision 810FD is not a bad deal. If you're into graphic design, need true and accurate color display, or just want control over a variety of screen display settings, you'll want to check out this monitor. GS

by Lori Robison

810FD

$549
MAG InnoVision
(800) 827-3998
(949) 855-4930
http://www.maginnovision.com

Motorola Talkabout T900

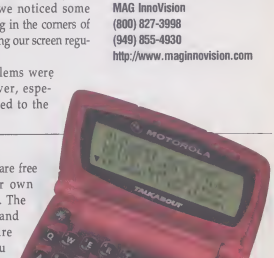
Originally, a pager could only display numbers, but numeric pagers eventually gave way to alphanumeric pagers that delivered short text messages. Now, two-way pagers such as the Motorola Talkabout T900 can receive messages as well as write and send replies.

The T900 is part of the new breed of two-way pagers that can not only communicate with other two-way pagers, but also send and receive Internet e-mail. E-mail capability is important because not everyone has a two-way pager, but nearly everyone has an e-mail account. Note, however, that the T900 can only receive e-mail sent to a special e-mail address.

The T900 itself features an address book that can hold up to 250 entries, such as home and work phone numbers, a mobile phone number, a wireless pager number, and an e-mail address. There is no field for street addresses, but then again the pager is meant to be a communicator, not a personal organizer.

The unit is fairly small, measuring 0.9 inches high x 3.19 inches wide x 2.15 inches deep and weighing just 3.86 ounces. The four-line display limits you to just 80 characters on the screen at once, but text is large and easy to read.

The small 36-key QWERTY keyboard is good for its size. Although it looks funny and isn't exactly comfortable to type on, we were able to type out messages using our thumbs with only a few typos. A number of preprogrammed responses are available to quickly reply to messages, although you are free to write your own custom reply. The keyboard and the display are backlit, so you should have no problem sending messages in the dark.



One AA battery powers the unit for about three weeks, and the unit is able to retain messages while you switch batteries.

Unlike more advanced units such as the Timeport P935, the T900 doesn't contain any personal information management tools and can not synchronize with a desktop computer.

The T900 costs $179.99, and service runs from $9.95 to $29.95. Be sure to check the WebLink Wireless site (http://www.pagemart.com) for coverage information in your area. GS

by Chad Denton

Talkabout T900

$179.99
Motorola
(800) 548-9954
(847) 576-5000
http://www.motorola.com

Radeon 32MB DDR Graphics Card

ATI stands out as one of the leading manufacturers of graphics chips and graphics cards. This year, however, ATI was falling behind other graphics card heavyweight champs such as NVIDIA and 3dfx as they released several new products. ATI hopes to bounce back with its new line of Radeon graphics cards. We tested ATI's Radeon 32MB DDR to see just how good it was.

The Radeon 32MB DDR looks good on paper. It has ATI's Radeon graphics chip, which supports the T&L (transform and lighting) functionality that has been heralded as such an important feature in NVIDIA's GeForce line of graphics chips. The Radeon 32MB DDR is a 4X/2X AGP graphics card with (as the name strongly suggests) 32MB of DDR memory. This graphics card has a 350MHz RAMDAC, which is quite common. Its maximum resolution is 2,048 x 1,536, which is also typical of most graphics cards today. The range of refresh rates for the Radeon 32MB DDR is 75Hz to 200Hz, which is a bit less than other graphics cards but is still sufficient to ensure flicker-free images.

The Radeon 32MB DDR supports the two major graphics card APIs: OpenGL and Microsoft's DirectX. This graphics card is compatible with the Windows 98, Windows 2000, and Windows Me operating systems.

We fired up our test computer and went to work on the Radeon 32MB DDR. Surprisingly, it wasn't as robust in our 2-D test as we expected. Its overall score was 125, which is a few points below most of the graphics cards we've tested this year. The Office Productivity score of only 119 is the main culprit for the Radeon 32MB DDR's mediocre showing in our 2-D test. It's been a long time indeed since we've seen a graphics card that couldn't crack the 120 mark in the Office Productivity test. The Content Creation score was pretty good, however, at 133.

We ran our Quake III test next, and the Radeon 32MB DDR proved it could play in the same ballpark as graphics cards based on NVIDIA's fiery GeForce2 GTS graphics chips. The Radeon 32MB DDR maintained a frame rate of 80.3fps at a resolution of 800 x 600, which is really good. The frame rate at a resolution of 1,024 x 768 was a respectable 68fps, which is just slightly lower than a typical graphics card using a GeForce2 GTS graphics chip.

Finally, we ran our 3DMark 2000 benchmark. The Radeon 32MB DDR scored 4,304 points in our test. This is a midrange score. We've seen a few graphics cards post better scores than this, but we've also seen several that did not fare nearly as well. 6S

by Michael Sweet

Radeon 32MB DDR
$279
ATI
(905) 882-2600
http://www.ati.com

T54H 15.1-inch TFT LCD Monitor

LCDs (liquid-crystal displays) continue to gain popularity among consumers, in part because they look so good on a desktop and are a great way to save space. Thin and lightweight, LCDs also boast flicker-free pictures at high resolutions and they consume very little power compared to their bulky CRT (cathode-ray tube) counterparts.

But LCDs have their drawbacks. These displays typically cost more than twice as much as CRT monitors of the same size and feature a much narrower field of vision. LCDs also often have trouble displaying accurate colors and smooth images at resolutions lower than the unit's recommended settings.

That's not to say that IBM's T54H 15.1 TFT LCD Monitor isn't a decent display. The 14.3-pound, 14.6-inch high x 15.8-inch wide x 7.9-inch deep monitor consumes only about 30 watts of energy and produces a very nice, nonflickering, color-rich picture at 1,024 x 768 resolution and a maximum refresh rate of 75 hertz.

The OSD (on-screen display) controls take some getting used to but are easy to operate once you get the hang of it. The T54H lets you adjust all the basic picture settings, including brightness, contrast, screen position, and color. You can even switch between analog and digital compatibility so that your monitor will operate effectively with your video card. However, we didn't like the fact that the control display disappears after only 10 seconds of inactivity, which means you have to reaccess a specific control display menu if you take too long to adjust your monitor settings.

During our tests of the T54H, we spent a lot of time adjusting the monitor's contrast and brightness settings so we could achieve the display's optimum grayscale output. We were only partially successful; darker gray shades were distinct, but the monitor never did display the lighter grays of our test images very well.

The T54H's vertical color registration was also noticeably off, and small text appeared distorted and fuzzy. Even so, the monitor displayed our color photographs extremely well. Images appeared rich, vibrant, and detailed on the screen, with smooth, even transitions among shadows.

This isn't the best flat-panel monitor we've reviewed, but it still produces top-notch color and sharp imaging overall. However, we wouldn't want to spend hours reading the fuzzy small text on the display's screen. If saving space and power consumption are not your top priorities, save your money and buy a CRT monitor that will be much cheaper than the IBM T54H. 6S

by Lori Robison

T54H LCD Monitor
$1,129
IBM
(800) 426-4968
(404) 238-1234
http://www.ibm.com

IBM P96

If you're searching for a quality 19-inch monitor, take a look at the IBM P96. The P96 sports sharp text, bright colors, and an OSD (on-screen display) that is simple to navigate. With these features, the monitor would be ideal in a desktop-publishing or video-editing environment.

The monitor has a 17.9-inch viewable image and delivers superior grayscale images and color intensities at the maximum resolution of 1,600 x 1,200 pixels at 85Hz. One of the P96's highlights is its dual video input capability. With this feature, you can connect two PCs to the monitor. The front of the monitor has a control you can use to switch back and forth between the two systems. The monitor's comprehensive OSD covers nine different languages and has buttons for adjusting the screen size, alignment, moiré, rotation, and more.

The P96 features flat-tube technology, which means the monitor's screen is almost completely flat. The technology reduces eyestrain and light reflection and decreases geometric distortion. In our tests, the monitor delivered good linearity when viewing spreadsheets and text was sharp in Microsoft Word documents. We did not witness any flickering, but there was moiré evident when we viewed grayscale images. Graphics were well-defined and color renditions were accurate when we viewed the high-resolution color JPEG (Joint Photographic Experts Group) Adobe Photoshop image.

With its sharp text, radiant colors, and user-friendly OSD, the P96 19-inch monitor would be a great addition to any home or office. The $575 price tag is a little high considering the recent price reductions in 19-inch monitors, but this unit is worth every dollar. GS

by Buffy Cranford-Petelle

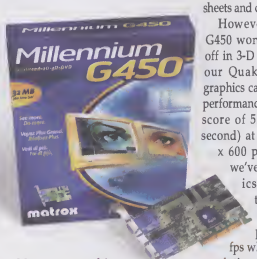
P96
$575
IBM
(800) 426-4968
(914) 765-1900
http://www.ibm.com

Matrox Millennium G450

Matrox graphics cards are popular with people who use their graphics cards to do work rather than to participate in 12-hour frag-fests. Matrox stays on this line with its newest release, the Millennium G450.

The Matrox Millennium G450 uses Matrox's new G450 graphics chip and supports AGP (Accelerated Graphics Port) 4X and 2X. It comes with 32MB of DDR (double-data-rate) SDRAM (synchronous dynamic RAM) and incorporates a 360MHz RAMDAC (RAM digital-to-analog converter), which is slightly faster than the RAMDACs most graphics cards use today.

The Millennium G450 has the typical maximum resolution of 2,048 x 1,536 pixels, and its range of refresh rates is decent, from 85Hz to 200Hz. This graphics card supports OpenGL and Direct3D, as well as several popular operating systems, such as Windows 95, Windows 98, Windows 2000, Windows NT, and Linux. The Millennium G450 also has a DualHead Display feature that lets you connect two monitors to one graphics card. Some office users will find this feature useful.



Matrox graphics cards are geared for office users rather than gamers and the test results reflect that. The Millennium G450 performed well in our 2-D tests but was mediocre in our 3-D testing.

In our SYSmark 2000 testing, the Millennium G450 scored a 127 in Office Productivity and a 130 in Content Creation, giving it an overall SYSmark 2000 score of 128, which is quite good. This graphics card will handle your spreadsheets and charts very well.

However, the Millennium G450 won't blow your socks off in 3-D games. We fired up our Quake III test, but the graphics card gave a lukewarm performance. Its first frame rate score of 52.8fps (frames per second) at a resolution of 800 x 600 pixels was OK, but we've tested many graphics cards that have topped 60fps in this test. The frame rate plummeted to 35.3 fps when we increased the resolution to 1,024 x 768. That's simply not very good compared to such hard-charging 3-D cards as the Creative Labs 3D Blaster Annihilator Pro and the Hercules Prophet II GTS.

The 3Dmark2000 test further underscored the Matrox Millennium G450's 3-D limitations. Its overall score in this test was 2,364, but we've tested a few cards that have broken the 3,000 mark.

Having said that, remember that the Matrox Millennium G450 is made for office and home users who aren't really interested in 3-D games. Instead, they need a solid graphics card to run their 2-D applications. The Matrox Millennium G450 fits this bill very well. Furthermore, the Millennium G450 costs at least $100 less than high-octane 3-D graphics cards. GS

by Michael Sweet

Millennium G450
$145
Matrox
(800) 361-1408
(514) 685-7230
http://www.matrox.com/mga/home.htm

Toshiba Satellite 1675CDS

The 1675CDS is Toshiba's entry-level Satellite model, targeted at SOHO (small office/home office) customers and students. The model we reviewed has an estimated street price of $1,099 and comes with an Intel Celeron processor, Windows SE (Second Edition), an internal 56Kbps (kilobits per second) modem, and a 6GB hard drive.

Specifications. The 1675CDS' 550MHz Celeron mobile processor gets help from 64MB of PC100 SDRAM (synchronous dynamic RAM) that you can expand to as much as 192MB. Its 6GB hard drive is modest by today's standards but is right in line with the hard drives other notebooks offer in this price range. The front edge houses both the notebook's integrated 1.44MB diskette drive and its integrated 24X CD-ROM drive, providing full-time access to all three storage devices. Its three-spindle design combined with its considerable size (2 inches high when closed x 12.56 inches wide x 9.96 inches deep from front to back) make it easy to guess the 1675 might weigh more than its reasonable 7.48 pounds. It also comes with a 10.8-volt NiMH (nickel-metal hydride) battery for portable power, a Conexant SoftK56 modem for Internet connectivity, and an ATI RAGE LT Pro video control chipset with 2X AGP (Accelerated Graphics Port) support and 4MB of SGRAM (synchronous graphics RAM).

Design. An attractive magnesium-alloy inset on the lid of the 1675 contrasts nicely with the rest of its dark plastic shell while affording its display a little extra protection. We were surprised at how flexible the lid still seemed, though; we would recommend a stout carrying case for protection during travel. The display itself is a 12.1-inch passive-matrix display that uses DSTN (double-layer super-twist nematic) LCD (liquid-crystal display) technology. Using DSTN displays is an effective way to keep a notebook's overall cost down, but the trade-off is that DSTN displays are generally dimmer and fuzzier than active-matrix or TFT (thin film transistor) displays. The 1675's display is no exception, although we thought it was certainly better than some of the DSTN screens we've seen. The speakers above the keyboard are very nice, exhibiting impressive volume and a solid range of sound.

We spend lots of time typing, so we appreciate a good keyboard when we see one. The 1675 comprises large, springy keys that are both easy to find and comfortable to use. Toshiba did add one feature that we generally frown upon. It put a row of cursor control keys (such as HOME and END) along the right end of the keyboard, but its standard keys such as BACKSPACE and SHIFT are wide enough that we didn't even notice. We also like the AccuPoint II pointing stick Toshiba offers in lieu of a touchpad. It is highly accurate; we did not have to spend much time using it before we were pointing and clicking like pros.

Final Word: The 1675CDS' passive-matrix display is dim and fuzzy, but this is our only gripe with this great value-priced Toshiba; comfortable input devices, great speakers, and decent performance scores make this one hard to pass up for the money.

Features

Processor: 550MHz Celeron
RAM: 64/192MB
Display: 12.1-inch DSTN
Dimensions (inches): 2 x 12.5 x 9.96
Weight (pounds): 7.48
Hard Drive: 6GB
Optical Drive: 24X CD-ROM
Connectivity: 56Kbps modem

Performance. The 550MHz Celeron inside the 1675CDS did a good job with BAPCo's SYSmark 2000 benchmark software. It produced scores of 95 and 89 in Internet Content Creation and Office Productivity, and an overall score of 92. That's right about where it should be, and its MultimediaMark 99 scores were right on the mark, as well. It got a 1567 overall score, which is higher than we've received from recent 550MHz Celeron notebooks, and its Image Processing and Audio Effects scores of 1775 and 1814 respectively also compare favorably to similar units. Toshiba estimates the 1675's battery life at two hours and 20 minutes, and although we couldn't test it precisely, it's probably pretty close.

Final Word. There are always compromises to make when purchasing a notebook this inexpensive, and although the 1675CDS' passive-matrix display isn't great, it seems a pretty good trade for this much value. The notebook has a great lineup of other features (such as speakers and keyboard) that more than make up for its one deficiency, and it produced performance scores that are right where they should be. The 1675CDS is a great notebook for word processing and other basic office applications, and it shouldn't have any trouble getting you where you want to go on the Internet. In short, you won't do much better than this for just over a thousand dollars, so if you've got a tight budget or student that needs a low-priced notebook, we'd recommend you give this one a look. 65

by Chris Trumble

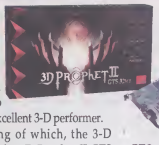
Satellite 1675CDS
$1,099
Toshiba
(800) 457-7777
(949) 583-3000
http://www.csd.toshiba.com

Hercules 3D Prophet II GTS

Hercules keeps the good times rolling with another strong entry in the graphics cards market. The Hercules 3D Prophet II GTS is based on NVIDIA's GeForce2 GTS graphics chip, which can mean only one thing: This graphics card is going to be hot.

The 3D Prophet II GTS is a 4X/2X AGP (Accelerated Graphics Port) graphics card with 32MB of speedy DDR (double-data-rate) memory. It has a 350MHz RAMDAC (RAM digital-to-analog converter), which is pretty typical among graphics cards. Although the card's top resolution of 2,048 x 1,536 pixels may sound impressive, this is also pretty common these days. The 3D Prophet II GTS's refresh rates range from 60Hz to 240Hz, and it has a 32-bit color depth. The video card supports the practically mandatory OpenGL and DirectX APIs (application program interface), and it works with the Windows 95 and Windows 98 operating systems.

The 3D Prophet II GTS scored slightly above average in our SYSmark 2000 test, but even an average SYSmark 2000 score translates into very good 2-D performance. Its Office Productivity score was 129 and Content Creation was 131, for an overall score of 130. These scores indicate the 3D Prophet II GTS is a solid



2-D graphics card in addition to being an excellent 3-D performer.

Speaking of which, the 3-D scores for the 3D Prophet II GTS were very good. It posted a frame rate of 88.9fps (frames per second) at a resolution of 800 x 600 in the first round of our Quake III test; this is among the highest frame rates we've seen. The 75.8fps frame rate at a resolution of 1,024 x 768 was also pretty impressive.

The 3D Prophet II GTS really shined in our final test, the 3DMark2000 test for 3-D ability. The 3D Prophet II GTS racked up a score of 5,363, which is the highest we've seen. Clearly, the 3D Prophet II GTS delivers great 3-D performance.

The 3D Prophet II GTS is one of the best 3-D graphics cards we've seen. Hercules has clearly been born again since Guillemot took over the reins. GS

by Michael Sweet

Hercules 3D Prophet II GTS

$359
Guillemot
(877) 484-5536
(514) 279-9960
http://www.hercules.com

HP PhotoSmart 618

If you're a photography buff, you know the Pentax brand name carries clout in the picture-taking world. If you're considering the Hewlett-Packard PhotoSmart 618, that's good news, because HP and Pentax jointly designed the camera, and Pentax markets the camera separately as the EI-200. Confused? Don't be. The companies label the camera differently, but the models are identical. What's important are the camera's excellent manual options and image quality.

The heart of the PhotoSmart 618 is the Pentax 3X optical and 2X digital zoom lens that focuses about 1.5 feet to infinity in normal mode and as close as 4 inches in macro and manual modes. The camera also uses HP's Imaging Technology and FlashPoint's Digita operating system for more creativity.

Advanced features include adding 45 seconds of sound to images; programmable auto exposure; three picture modes; three shooting modes; auto and fixed ISO settings; three metering settings; three white balance settings; three color modes; and diopter adjustment. The camera takes uncompressed TIFF (Tagged Image File Format) shots and can send images to compatible HP printers using HP's JetSend infrared technology.

Accessing the options isn't difficult using the camera's menu and navigational buttons. A few icons are vague, so keep the manual close initially. Images are shot at 1,600 x 1,200 pixels or 800 x 600 pixels in TIFF or JPEG files and saved to a 16MB CompactFlash card that stores two TIFF shots and between 15 and 165 JPEG images.

Our outdoor shots rendered great brightness and accurate colors. Our indoor shots were nearly as impressive, although several taken under fluorescent lighting at default settings were darkish yellow. Shots under tungsten lighting had better exposure and color balance. Overall, the images rate well above average.

Also pleasing is the camera's design. The LCD's (liquid-crystal display) placement makes it easy for you to leave your thumbprints on the screen, but the camera looks and feels good. The oversized right side has a rubber grip and is a comfortable fit, as is the slightly tilted shutter button. Additionally, there's an automatic sliding lens cover, built-in speaker, USB connection, and mode dial.

The camera can use alkaline or rechargeable NiMH batteries but ships with preferable lithium rechargeable batteries. It also includes HP Photo Imaging software, and ArcSoft's PhotoImpression and PhotoMontage.

At $600, the camera is mid-priced, but its features and image quality propel it higher. Photographers with moderate and advanced skills should find certain attributes of the PhotoSmart 618 appealing. GS

by Blaine Flamig

PhotoSmart 618

$600
Hewlett-Packard
(888) 474-3867
(208) 376-3686
http://www.hp.com

WinBook Si 800

WinBook touts its Si 800 as "a high-performance multimedia notebook that doesn't come with a high-end price tag," and that's about the size of it. The $2,399 Si 800 is an incredible value with its 800MHz Pentium III processor, 14.1-inch active-matrix display, and integrated DVD-ROM drive. We generally see this combination of features in notebooks that cost hundreds or even thousands of dollars more. We were happy with the way it performed, and aside from one or two little things, we like the way WinBook put it together.

Specifications. The Si 800 we received for review came with Intel's 800MHz mobile Pentium III chip and 128MB of PC100 SDRAM (synchronous dynamic RAM that meets Intel's PC100 specification) that you can expand to 256MB. A spacious 10GB hard drive is standard, as are the integrated 1.44MB diskette drive and 6X DVD-ROM drive that sits on the Si 800's left edge. We've always been fans of having simultaneous access to all of a notebook's storage devices without swapping drives in and out, but sometimes having all these drives integrated makes notebooks fairly heavy. However, this isn't a problem for the Si 800 because WinBook managed to keep its weight to a meager 6.9 pounds. It may not sound like much, but a couple of pounds can make a huge difference if you plan on having your notebook strapped to your shoulder for a whole day of shuttling to different offices or running through airports.

A 14.4-volt Li-Ion (lithium-ion) battery keeps the Si running when you can't take advantage of a wall outlet, and an internal 56Kbps (kilobits per second) modem makes it easy to stay connected on the go. The 14.1-inch Goldstar TFT (thin film transistor) display gets its instructions from ATI Technologies' RAGE Mobility-M video chipset with 2X AGP (Accelerated Graphics Port) support and 4MB of video RAM. A little more memory would have been nice, but we have generally been quite happy with the performance of Mobility-M chipsets. Our test unit also came with Windows 98 SE preinstalled although shortly after we reviewed our unit, WinBook started shipping it with Windows Millennium Edition.

Design. Like nearly every WinBook we've reviewed, the Si 800 looks pretty plain at a glance. Its no-nonsense black case is solid and seems ready to travel. The lid panel is moderately flexible, but it shouldn't give you any problems as long as you stow it in a sturdy carrying case while traveling. The XGA (Extended Graphics Array) display supports resolution up to 1,024 x 768 and looks sharp and bright. The speakers, which are located on the Si's front edge, produce plenty of volume and decent sound, but they do lack treble. This detracts some of the clarity from the sound they project, but all in all they're not bad.

The keyboard was the only component of the notebook we weren't crazy about. It is large enough to be comfortable and the keys are deep and springy, just the way we like them, but it falls prey to a common and highly frustrating design problem. It has a set of cursor control keys (HOME, END, PAGE UP, PAGE DOWN, etc.) arranged vertically along the right edge of the standard keys, so they frequently get in the way. When you get up a good head of steam and you're typing at full speed, few things are more disruptive than hitting HOME instead of BACKSPACE. The good news is that if you can get used to this one foible, you'll probably like this keyboard quite a bit. If you can't, you can at least take solace in the fact that WinBook equips the Si with a responsive, accurate touchpad.

Performance. The Si 800 put up some decent performance numbers upon completing BAPCo's SYSmark 2000 benchmark tests. It cranked out a 155 in Internet Content Creation, a 128 in Office Productivity, and had an overall score of 139. The Office Productivity was a little low, which was the reason the overall score was lower than we expected. We've had a 750MHz notebook and a couple of 700MHz notebooks that performed as well or better, which may have been partly due to larger supplies of video memory. In the end, though, each of the notebooks that scored higher cost at least $1,500 more than the Si. WinBook's technical specifications state the Si can run for as long as three hours on a single battery charge with the help of software and hardware power management.

Final Word. The Si 800 didn't score as high in our benchmark tests as we hoped it would, but it performed at a considerably higher level than most notebooks we've tested in its price range. The only structural aspect of the notebook we didn't care for was the arrangement of the keyboard; otherwise, we got along fine with the Si's display, speakers, touchpad, and overall design. In other words, if you're looking for the most performance you can get for $2,400 you'll find it with this notebook.

by Chris Trumble

Final Word: Not quite as overpowering as we'd hoped an 800MHz Pentium III notebook would be, but it provides outstanding performance and a rich feature set compared to other units in its price category.

Features

Processor: 800MHz Pentium III
RAM: 128/256MB
Display: 14.1-inch TFT
Dimensions (Inches): 1.6 x 12.2 x 9.9
Weight (pounds): 6.9
Hard Drive: 10GB
Optical Drive: 6X DVD-ROM
Connectivity: 56Kbps modem

Si 800

$2,399
WinBook
(800) 254-7866
(614) 850-3000
http://www.winbook.com

Xerox WorkCentre XD125f

If you're searching for a speedy laser MFD (multifunction device), look no further than the Xerox WorkCentre XD125f. This combination laser printer and digital copier really impressed us with its quick prints and copies.

As a copier, the WorkCentre XD125f is very much like a standard copier; even the controls for adjusting the exposure and contrast are similar. This machine has much more functionality than a normal copier, though. Just plug the X125f into your computer, and you can use the WorkCentre as a laser printer, as well.

The copier can reduce and enlarge copies in 1% increments ranging from 50% to 200%, and you can print up to 100 multiple copies. The WorkCentre XD125f includes a 250-sheet paper tray and an automatic document feeder that supports up to 30 pages. This MFD can handle different types of media, including standard copier paper, envelopes, and card stock. The unit only measures 14.9 inches high x 20.4 inches wide x 19.3 inches deep and weighs 48 pounds.

Both the printer and copier offer a 600 x 600dpi (dots per inch) resolution and produce sharp prints and copies. The specifications for this unit call for up to 8ppm (pages per minute), but in our tests, this machine exceeded that time, printing 10 pages in 1:11.

The device printed the high-resolution graphic we used in our tests in a record time of 0:39. We did notice some banding in the graphic, but overall the output was very crisp. The unit also produced six pages of text and graphics in an impressive 0:49. We noticed only a few drawbacks to the WorkCentre XD125f. The MFD took 1:28 to print the PowerPoint slides, which was a below-average time, and the unit takes a few minutes to warm up before making prints or copies. Considering the solid output in our other tests, these drawbacks wouldn't stop us from purchasing this machine. GS

by Buffy Cranford-Petelle

WorkCentre XD125f

$699.99
Xerox
(800) 832-6979
(203) 968-3000
http://www.xerox.com

iREZ KritterUSB

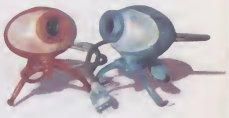
The KritterUSB from iREZ is aptly named. With thin spidery legs and a round body, the camera indeed appears to be a small critter crawling across a monitor top. In actuality, the camera's unique design makes it a good choice for users who need a Web cam that performs equally well on a PC or notebook computer.

From the outset, the KritterUSB's appearance grabs your attention. Our review model was flavored with a transparent tangerine color, but models are also available in blueberry, ice, and black. Although the colors are attractive, the camera soon began to frustrate us, primarily because of its extremely lightweight and wobbly support legs. The legs don't provide a solid base, and the 34-inch cord the camera uses to connect with a PC is far too short. Even the slightest bump to our monitor caused the camera to shift completely away from the frame of focus, leaving us constantly readjusting the camera.

One positive aspect of the camera is that you can fold the legs upward when you're not using it to cover the camera's 4mm f2.0 lens for protection or privacy. iREZ also offers the camera with an optional stand for PCs that appears to make it more stable. If you have an iMac, you might want to check out the iMac Wand attachment, which will make the camera a little more stable when you place it on top of your iMac. Overall, we think the camera's legs are most adept at attaching themselves to a notebook, which gives it a secure, solid base.

To test the camera, we had to depart from using our usual testing machine and connect the camera and install its software to a custom-built PC, which had a 450MHz Pentium III processor, 128MB of RAM, and Windows 98 SE. Each time we attempted to operate the KritterUSB on our usual test machine, the system froze and we were forced to reboot. We had no such problems when we connected the camera to the custom-built machine, which led us to believe the problem may have been a USB conflict. We viewed the video the camera produced on a 17-inch IBM monitor.

If you can get the camera to sit still, you should like the results it produces. The video we viewed was clear, sharp, and had good colors. At the default settings, the camera's image quality was a bit dark, but we were able to easily adjust the settings manually through the included software. The camera is capable of taking video at 640 x 480 pixels, but it grabs a smoother frame rate of 30fps (frames per second) at 320 x 240 pixels. (A frame rate of 30fps is typically needed to achieve smooth video quality.)



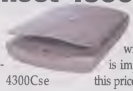
At $129.95, the camera isn't cheap. It doesn't include a microphone, but it does ship with iREZ Reel-Eyes LE for iMac users and VIDCAP32 and AMCAP for PC users. Combined, the software allows users to capture and edit video, send video e-mail and postcards, videoconference, take still images, and use the camera for surveillance purposes. GS

by Blaine Flamig

KritterUSB

$129.95
iREZ
(480) 922-0044
http://www.irez.com

HP ScanJet 4300Cse



You won't find the Hewlett-Packard ScanJet 4300Cse among the best scanners we've reviewed, but the machine still holds its own against the lower-priced models we've evaluated. Plus, it comes with some cool features and decent image quality for the home user.

With 600dpi (dots per inch) resolution and 36-bit depth capability, the 4300Cse reproduces sharp, clear image details and vivid midrange color shades that blend nicely. However, the scanner doesn't do as well at reproducing light and dark shades like other scanners in this price category, and the details within these areas tend to get lost. The 4300Cse also scored low on our grayscale test; it could only distinguish 22 shades of gray, five below our benchmark average of 27. Black-and-white graphics appear crisp and sharp, however, while text-documents appear clean and very readable.

The sturdily constructed, 3.5-inch high x 12-inch wide x 19.5-inch deep, 7.5-pound 4300Cse comes with a flexible lid you can lift up horizontally to scan thick media, such as books and magazines. There also are three buttons on the front of the unit for quick scanning to your PC, printer, or e-mail application and a digital readout panel and toggle switch beside the one-touch buttons. The readout lets you see how many copies you've sent to your printer (you can send up to 99) while the toggle switch lets you decide whether to send color or black-and-white output to the printer.

Much of a finished project's appearance and the ease with which a user can operate the scanner depend largely on the quality of the software bundle that accompanies the machine. The 4300Cse comes with a software bundle that is impressive for a scanner in this price range. In addition to the HP PrecisionScan LTX scanning software, the 4300Cse arrives with Corel Print House 2000 and Adobe ActiveShare for image editing and management, Trellix Web Design for creating Web sites, and more.

Hooking up the scanner to our computer was easy, thanks in part to the accompanying Setup/Configuration poster. We just installed the software, rebooted the computer, connected the scanner's USB cable (a parallel connector is also included), and were ready to go. The scanner automatically calibrates with your monitor so the colors on your hard copy and the monitor image match. We also were impressed with the 4300's scan times, which ranged from a quick 15 seconds for a 150dpi index card-sized color-block image to 2:33 for a large photograph scanned in at 600dpi.

With its speedy scan times, decent color reproduction and imaging capabilities, software bundle, and extras for one-touch scanning and copying, the $149 ScanJet 4300Cse should work fine for the home user who wants to scan images for the Web or e-mail attachments. However, the machine's lackluster color reproduction performance across light and dark shades means the 4300Cse is not suitable for the home- or small-office user. GS

by Lori Robison

ScanJet 4300Cse

$149
Hewlett-Packard
(800) 752-0900
(650) 857-1501
http://www.hp.com

Kodak DC5000

Eastman Kodak describes its DC5000 digital camera as "rugged" and "durable," and it certainly is. This 2-megapixel camera has oversized buttons so you can easily take shots while wearing gloves, rubber grips for extra traction, and tough metal trimming to help the camera stand up to any pounding it may take.

As a bonus, the camera features good images and the same easy-to-use menu we expect from a Kodak camera. Images we shot at Best, Better, and Good quality settings at resolutions of 1,760 x 1,168 pixels or 896 x 592 pixels exhibited good crispness and definition, but the colors weren't quite as strong as other Kodak models. However, the camera's macro setting for shooting objects from 10 to 20 inches produced focused and bright shots. Overall, the images are suitable for smaller prints but rate below the top tier of images we've seen from other cameras.

What distinguishes the DC5000 from other models is its design, which is big, bulky, and hefty (weighing a pound without batteries). Normally, we would consider those characteristics negatives, but in this case, they are definite positives. The camera is geared to those who take shots where dirt, water, sand, smoke, grit, and grime are prevalent.

To those ends, Kodak constructed the DC5000 with special seals to make it "weatherproof," not "waterproof." That means you can shoot in light rain or mist but not underwater on your next deep-sea diving adventure. In addition, the compartments that hold the four AA alkaline batteries (NiMH [nickel-metal hydride] batteries are optional) and 8MB CompactFlash Storage card are designed to be extra secure.

Beyond its design, the camera has an autofocus lens (30mm to 60mm) with 2X optical and 3X digital zoom and accepts optional 37mm attachments. In addition, the camera has auto and manual exposure, a four-mode automatic flash, and automatic white balance with daylight, tungsten, and fluorescent settings. There also are multi-pattern and center-weighted metering settings, USB-transfer options, and special effects modes for sepia, borders, and black-and-white shots.

On the downside, the camera is noisy, omits a burst mode and other advanced options, and ships without an A/C adapter and battery charger. In addition, the camera's top is somewhat crowded with the status display area and shutter, as well as the flash, self-timer, and focus buttons.

Overall, we can't think of a better-suited camera for taking shots in soggy, dusty, and sandy locations. Plus, the camera produces very good images, especially those taken outdoors. GS

by Blaine Flamig

DC5000

$590
Eastman Kodak
(800) 235-6325
(716) 724-4000
http://www.kodak.com

HP OmniBook 900

Notebooks such as HP's OmniBook portable PCs that are both full-sized and very thin (and therefore, nice and light) are becoming increasingly popular. The industry calls these units thin-and-light notebooks because although they are larger than mininotebooks, they weigh considerably less than standard full-sized units (usually between 4 and 7 pounds). The OmniBook 900 is a prime example of a thin-and-light notebook. It comes with a nice 13.3-inch display and a full-sized keyboard and weighs a mere 4.3 pounds without its external drives.

Specifications. The 900 currently comes with your choice of three Intel Pentium III processors. HP sent us the 650MHz variety along with 128MB of a possible 320MB of RAM, 64MB more than its standard compliment. Adding the extra memory bumps the notebook's base price of $2,649 up to $2,819, and adding the optional DVD-ROM drive adds another $335 for a grand total of $3,154. The DVD drive is external and attaches to the 900 through a special port on its right edge, which also accommodates the included external 1.44MB diskette drive. Notebooks with swappable, external drives aren't for everyone, since they require some users to carry the drives with them on the go, but having the drives outside the 900's case helps keep the notebook light.

Our review unit came with Windows 2000 preinstalled, although you can opt for either Windows 9x or Windows NT 4.0, if you prefer. It also included an 11.1-volt Li-Ion (lithium ion) battery and ATI Technologies' RAGE Mobility-M video control chipset with 2X AGP (Accelerated Graphics Port) support and 4MB of video memory. We were surprised that HP didn't offer a standard modem with the unit, but you can easily add a PC card modem to one of the two PCMCIA (Personal Computer Memory Card International Association) slots on the 900's right edge.

Design. We like the look of the 900, with its thin case and gently sloping lines. Although the outer shell is fairly flexible in several areas, it doesn't seem at all flimsy. The lid panel gives a little but affords the LCD (liquid-crystal display) plenty of protection, and all of the 900's hinges, switches, and moving parts fit together snugly. The display is a beauty. It provides a razor-sharp picture and good color, and although it could perhaps be a smidgen brighter at its highest brightness setting, it is easy to read from a variety of angles. One of the knocks we've had against some of the thin-and-light units we've seen has been weak, scratchy speakers, but HP did a good job of selecting the pair it put on the front edge of the 900. They do lack the deep, rich bass we've observed in heavier notebooks, but they project decent volume and don't distort at all; and since they are on the front edge they are mostly out of the way while you type.

The 88-key Windows keyboard that occupies most of the base felt a little shallow to us but is excellent in every other regard. The keys are large and easy to quickly find, and HP arranged the cursor control and function keys well out of the way. A very nice pointing stick sits in the midst of its keys, and the 900 comes with an agreeable touchpad for users that prefer them. There are two sets of left- and right-click buttons (above the touchpad and below it), making it very convenient to use either pointing device with one hand.

Performance. The 900's PIII got the second-best overall SYSmark 2000 score we've gotten from a 650MHz chip: a 113. It also cranked out a second-best Office Productivity score of 111, but its Internet Content Creation score of 115 came in third. Although we were unable to chart its multimedia performance (MultimediaMark 99 isn't compatible with Win2000) all of the impressions we gathered of the 900's multimedia capabilities were good ones. HP's specifications estimate three hours of battery life from a single charge.

Final Word. The HP OmniBook 900 is very portable (although you shouldn't forget about its external diskette and optical drives), and we think its display, speakers, and input devices are very nice. We especially like the option of using either a pointing stick or touchpad, and on top of all that, its performance scores were fairly competitive. We wish it came with a standard modem, but other than this, the 900 is a pretty good buy, even with all of the bells and whistles we got with ours. GS

by Chris Trumble.

Final Word: No modem, and its diskette drive and optional DVD drive are both external, but the 900 is very light at just 4.3 pounds; very nice display, speakers, and input devices combined with good performance scores make the 900 a great catch.

Features

Processor: 650MHz Pentium III
RAM: 128/320MB
Display: 13.3-inch TFT
Dimensions (inches): 1.4 x 11.95 x 9.3
Weight (pounds): 4.3
Hard Drive: 12GB
Optical Drive: 6X DVD-ROM drive (optional)
Connectivity: none standard

OmniBook 900

$3,154
Hewlett-Packard
(800) 307-6397
(650) 857-1501
http://www.hp.com

IBM InfoPrint 12

Most of IBM's printers are definitely targeted toward the medium to big business market, but the InfoPrint 12 is an exception. This printer is an excellent home or small office printer, and it costs less than $400.

The InfoPrint 12 has a speedy 66MHz processor and 4MB of RAM, with room for a maximum 68MB of RAM. You can connect to this printer via a parallel or USB (Universal Serial Bus) connection, and you can opt to add an Ethernet card so you can use it in a small office network. The InfoPrint 12 is a fairly small printer, measuring 9.9 inches high x 14.2 inches wide x 16.1 inches deep and weighing 25 pounds.

This printer prints 12 (ppm) pages per minute, and has resolutions of 300, 600, and 1,200dpi (dots per inch). It supports the popular PCL6 and PCL5e PDLs (page description languages). The InfoPrint 12 has a 250-sheet primary paper tray and a 100-sheet auxiliary tray.

You can use this printer with a wide variety of operating systems, including the various Microsoft Windows platforms and Red Hat Linux.

The IBM InfoPrint 12 proved to be a pretty good little printer in most of our tests. The printer only needed 15 seconds to print the first page of a 10-page text file and needed only 59 seconds to print the entire document. This is speedy for a sub-$400 printer.

The InfoPrint 12 proved to be just as expeditious in our PowerPoint test. It printed the first page of a three-page document in 15 seconds and completed the print job in 25 seconds.

The one area in which the InfoPrint is a little weak is graphics. We couldn't print our Photoshop image at the printer's highest resolution (1,200dpi), so we had to settle for the next best resolution, 600dpi. The printer took 44 seconds to print the image at the lower resolution, which isn't too shabby. The image quality wasn't that great, though; there was noticeable banding throughout. Considering that you wouldn't buy this printer for its graphics ability, though, this is a fairly minor problem.

Overall, the InfoPrint 12 is a good deal. It prints quickly, and the quality of the text documents is great. If you're looking for a sub-$400 laser printer for your home or small office, the Infoprint 12 will be hard to beat. GS

by Michael Sweet

InfoPrint 12

$399
IBM
(888) 746-7426
(404) 238-1234
http://www.ibm.com

Apollo P-2150U

Sometimes, the less said, the better. But we can't just leave this space blank, so here are our kindest words for the P-2150U: If you need an inexpensive USB (Universal Serial Bus) printer for your Windows 98 system, and you only want to print occasional text documents, the Apollo P-2150U can fit your needs. Beyond that, it has a funky purple tray assembly that younger users might like, a one-year warranty, and 90 days of free telephone technical support. Unfortunately, you'll probably be calling a lot.

Trying to get the P-2150U to run through our tests was an exercise in frustration. Its installation software caused a Blue Screen of Death, which is an error that will make you reboot your computer. The Apollo also stopped in the middle of a few print jobs. Most notably, it refused to print more than a few inches of our full-page Adobe Photoshop floral photograph on photo paper. Oddly, it printed our full-page portrait photo just fine.

We can't complain about the P-2150U's 3.28ppm (pages per minute) speed while printing draft-quality text. All of the Apollo's text looked great compared to the other printers in this price bracket.

The P-2150U was a bit slow in printing our Word (0.47ppm) and PowerPoint (0.78ppm) documents. Even though its maximum black resolution is 600 x 600dpi (dots per inch), it can only achieve 300 x 300dpi in color. This is a recipe for very grainy color graphics and photos, even at arm's length. However, the colors were perky and pleasant—just grainy.

The P-2150U comes with a starter color cartridge, but not a black one. It does have a thin printed manual with good, illustrated instructions, which is handier than the CD-only manuals some manufacturers foist on the public. The P-2150U can hold both a black and a color cartridge, but it can print with only one installed.

Apollo printers use older Hewlett-Packard ink cartridges, which are easy to find in stores. The P-2150U uses a $27 455-page black cartridge, a $29.59 310-page color cartridge, and an optional $33.14 212-page photo cartridge. These aren't very economical cartridges compared to the ones in more modern printers.

You can find better speed and print quality in comparably priced Epson and Lexmark printers. However, if you really want an Apollo, we would advise you to go with the Apollo P-2200 ($69). We didn't have any problems with it, and its speed and print quality were the same.

by Marty Sems

P-2150U

$79
Apollo
(877) 692-7655
(214) 503-2222
http://www.myapollo.com

EIDE vs. SCSI

Performance & Price Determine How Much You Need Speed

Price vs. performance may be one of the world's oldest dilemmas. Do you buy the draft horse or the pack mule? The luscious Lexus or the frugal Ford? What inevitably settles the question is a mixture of necessity, budget, and ego.

This same dilemma illustrates the choice computer users have to make when selecting hard drives. These days, we only have two interface options from which to choose: EIDE and SCSI. SCSI is faster and considerably more robust than EIDE, but EIDE, although it is still struggling to match SCSI's data rates, remains considerably more affordable and thus dominates the consumer market. Here, we offer a guide to these two standards, where they are now, and where they're going.

■ **Two Roads, One Destination.** Understanding the fundamental differences between EIDE and SCSI requires some knowledge of how data moves around inside your computer. A typical modern desktop computer is an extremely complex machine, but on one simple level, it can be broken down into three parts: the CPU, the RAM, and everything else. The CPU performs much of the computer's hard labor, such as crunching numbers and executing commands. The RAM is a sort of temporary workspace, a storage area the CPU uses to house data and instructions for future processing, as well as previously processed data that must then be sent somewhere else (such as the hard drive or video card).

Terms To Know

ANSI (American National Standards Institute)—The nationwide organization for establishing standards. ANSI's subcommittees study specifications and submissions and decide upon a standard. Manufacturers then adopt the standard as a way of promoting compatibility among electronic devices.

ATA (Advanced Technology Attachment)—A drive specification defined by ANSI that is also commonly known as IDE, EIDE, or UDMA.

ATAPI (Advanced Technology Attachment Program Interface)—A way for non-hard drive devices to connect to an ATA port. CD-ROM drives, removable drives, tape drives and similar devices all use ATAPI.

bus—The main pathway that data travels inside a computer. Examples include the PCI (Peripheral Component Interconnect) bus, ISA (Industry Standard Architecture) bus, and the SCSI bus. ATA IDE is not a bus, but instead attaches to the ISA bus or PCI bus of a computer.

bus speed—The maximum speed at which data can travel on the bus, measured in MBps (megabytes per second). The PCI bus has a maximum of 133MBps while the present maximum for the SCSI bus is 160MBps. Although EIDE drives don't have a bus speed, the maximum speed for their port connection is sometimes called their bus speed. The present maximum is 100MBps.

bus width—The amount of data that can travel along the bus at a time.

cache—A small amount of high-speed memory used to speed up common operations.

EIDE (Enhanced Integrated Drive Electronics)—Also known as ATA-2, EIDE introduced features that enabled larger hard drives, faster bus speeds, and support for new types of drives.

IDE (Integrated Drive Electronics)—Technically, any type of drive that has its control circuitry built in. In common usage, IDE usually refers to the ATA IDE drive standard of connecting a hard drive to a data bus.

DMA (direct memory access)—The ability of a device to communicate directly with the RAM, rather than having to interrupt the CPU in its work.

scatter-gather—The ability to send and receive data to a variety of devices at the same time. This is also known as command queuing.

SCSI (Small Computer System Interface)—An ANSI-defined interface standard for connecting peripherals to a computer. SCSI devices use a host adapter to connect the SCSI data bus to the computer's main bus.

synchronous communication—When two devices are able to communicate with each other in both directions simultaneously.

terminator—On the last device of a chain or network, a resistor that signals the end of the chain and prevents signals from reflecting back down the chain once they reach the end. In a SCSI system, each end of the SCSI bus requires a terminator for correct operation. This might be a separate device (about the size of a credit card) or a setting in the first and last device on the chain.

UDMA (ultra DMA)—A revised version of DMA for the ATA IDE hard drive standard that improved speed and functionality.

Ultra ATA—Commonly interchangeable with UDMA, Ultra ATA refers to the more recent high-speed standards for ATA hard drives.

How A Hard Drive Works

Despite the differences between SCSI and EIDE interfaces, the internal workings of both types of hard drives are similar. They both read and write data from spinning magnetic disks using multiple heads.

1. Heads. These tiny units are mounted on actuator arms that move them back and forth across the platter surfaces. When you hear clicking sounds from your hard drive, those are the heads flying back and forth to read and write data. The platter, which spins very fast, creates a thin cushion of air. Each head catches this air and "floats" less than a hair's breadth off the platter's surface.

2. Drive electronics. The control and interface circuitry of the drive. These communicate with the computer, using EIDE or SCSI technology. They control the platter speed and head movement and convert the digital computer data to an analog signal that gets recorded on the platters magnetically.

3. Actuator arm assembly. The actuator arm actually has many "arms;" in fact, it has two for each platter, each of which carries a head. The combination of the arm's reach and the spinning motion of the platters allow the heads to reach any sector of the platter and read its data in milliseconds.

4. Platters. These are the actual storage media of the drive. The platters, which are coated with special materials, retain data magnetically as the heads write on them. This type of storage is fairly permanent and can last for many years without degrading. Drives can contain from one to five disks; both sides of each platter are used, each of which has its own head.

5. Data input. The means by which information travels, either via an EIDE or SCSI interface.

Cache (not shown). Modern hard drives also contain a small amount of high-speed memory that the hard drive uses in various ways to improve speed and access times. In effect, the hard drive's circuitry tries to guess what data your computer will need next and have it already found and stored in the cache. If it guesses correctly, it just sends the cached data to the computer instead of having to read from the relatively slow platter mechanism.

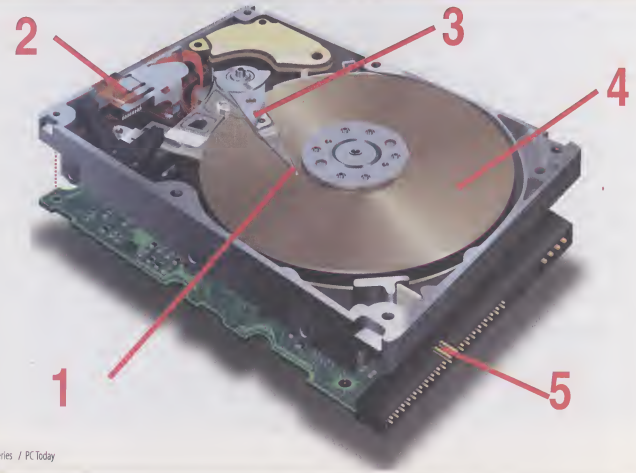
Important Measurements

In addition to the physical makeup of a hard drive, you should be familiar with how hard drives are rated.

Areal density. The amount of data a hard drive can store in an area of a platter, expressed in Gb/sq.in. (gigabits per square inch). As manufacturing technology improves, each new generation of hard drives is able to pack more data on each platter. This makes hard drives smaller and more energy efficient, increases maximum storage space, and reduces cost. In addition, the compact data can be read more quickly, meaning faster data transfer rates inside the drive.

Seek time. How fast (in milliseconds) a hard drive can move its heads to a particular track. Faster head movement means data is retrieved faster and overall speed is increased.

Spindle speed. The number of rpm (revolutions per minute) a hard drive's spindle and platters make when driven by the motor. Today's hard drives have spindle speeds of 5,400, 7,200, or even 10,000rpm. □



If every part of the computer tried to communicate with the CPU and RAM at the same time, there would be chaos. Modern CPUs are built to handle multiple data streams to a certain extent, but there are limits. It would be like many people speaking with you at once. You might be able to manage two or even three conversations, but a dozen people speaking with you at once would be overwhelming.

To prevent such data congestion, the computer uses specific lines of communication called data buses. Every part of a computer is connected to a bus, which it shares with other devices to send and receive data. The bus is regulated by the motherboard and CPU. If a device needs to get the CPU's attention, it sends a signal down the bus, which is received and dealt with as needed. Again, it would be like you turning from speaker to speaker, saying: "OK, your turn. Now, your turn."

Despite its important role in the system, the hard drive is just one of many peripheral devices; it must send and receive data on the bus like everything else. When the CPU requires a specific portion of data, it checks the RAM to see if it's there. If not, the CPU sends a request for information to the hard drive, which then responds to the request and sends the needed data back to the CPU or RAM.

The main difference between EIDE and SCSI devices is the way they communicate with the rest of the computer. EIDE devices plug straight into one of the computer's main data buses, moving and competing with other traffic on the bus while the SCSI host adapter creates a separate bus on which SCSI devices communicate.

■ **Tale Of The Tape.** Perhaps the biggest difference between EIDE and SCSI hard drive systems is price. EIDE drives can cost less than half as much as a SCSI drive with a similar capacity. In addition, every PC today comes with built-in support for EIDE drives while SCSI support can cost an extra $125 or more depending on the brand and model.

This difference exists because the SCSI system was designed from the ground up as a powerful, flexible, and expandable way to connect peripherals to your computer while the EIDE system is limited both in type and number of devices (typically four) you can connect. EIDE is generally considered an "inside-the-box" technology, meaning all the EIDE devices you see are designed to be internally mounted inside the PC. For example, you won't find an EIDE scanner or external

EIDE vs. SCSI

As you've been reading, the EIDE and SCSI interfaces both have their strengths and weaknesses. Here, we've compiled a quick-reference chart that will help you grasp the differences between the two.

EIDE

Pros

Price: Up to hundreds of dollars cheaper than SCSI.

Speed: In single-user computers, EIDE is able to hold its own or even beat SCSI hard drives.

Simplicity: All you have to do is set the jumpers and plug in the drive and you're ready to go.

Feature Improvements: Ideas used in SCSI system are slowly being adopted by EIDE drives.

Cons

Limited Space: EIDE supports a maximum of only four drives in most computers, unless expanded.

Limited Flexibility: EIDE is used only with hard drives, CD-ROM drives, and other ATAPI-compliant drives. No external connections are possible.

Limited Bus Speed: Despite the latest leaps, EIDE's maximum bus speed still lags behind SCSI.

Limited Multitasking Support: EIDE was never designed to be a multitasking system.

SCSI

Pros

Flexibility: SCSI's design allows a plethora of different kinds of devices to be attached, including digital cameras, CD-ROM drives, and external hard drives.

Space: You can attach as many as 15 devices both inside and outside the computer. Plus, you can use as many as four adapters at once, for a total of 60 attached devices.

Multitasking Speed: SCSI was designed to maximize efficiency with multiple devices and multiple users.

Bus Speed: New Ultra 160 standard cranks the juice up to 160 MBps.

Cons

Price: Relatively expensive, both for adapters and SCSI devices.

Complex To Set Up: Novice users may be confused with the variety of settings available although there are steps being taken to make SCSI a Plug-and-Play installation.

Although it's plain to see SCSI is the superior technology, price keeps it from becoming more popular. In the consumer PC market, a couple hundred dollars difference is a decisive factor.

hard drive, but SCSI versions are readily available. In addition, SCSI has had such features as command queuing, scatter-and-gather, and synchronous communication for a long time, all of which greatly increase speed and efficiency with multitasking. Multitasking speed is essential for powerful computers, especially in a multiuser network where several people could be accessing data at the same time. New EIDE systems are just starting to gain these features and still have a ways to go to catch up.

Perhaps SCSI's most attractive feature is its expandability. Even older SCSI systems can support many more devices than EIDE, up to seven total. Newer SCSI incarnations can handle as many as 15 devices compared to EIDE's native four-drive limit, but you can overcome this limit with special controllers.

Although it's plain to see SCSI is the superior technology, price keeps it from becoming more popular. In the consumer PC market, a couple hundred dollars difference is a decisive factor. With EIDE, you're getting a computer that is less powerful, but for everyday users, the expandability and flexibility of SCSI is overkill. Who needs a SCSI scanner when you can get a USB (Universal Serial Bus) model for the same price or less? Who needs a multitasking-oriented hard drive system when only one person is using the computer at a time? Moreover, with single-user systems, EIDE hard drives actually tend to be faster than their SCSI brethren due to the simplified connection to the computer.

■ **The EIDE Story.** EIDE had its roots in the early 1980s, when manufacturers were searching for a better way to communicate with and control computer hard drives. IDE drives, which have their control circuitry built-in, were introduced to replace clunky older technologies that relied on external controller cards. IDE drives were more reliable, cheaper to make, and also opened up the horizon for even more future improvements. Although manufacturers have created several types of IDE systems (in fact, SCSI is technically an IDE standard), the one we know today as IDE is ATA IDE. Although technically not the same, the terms ATA and IDE are commonly used interchangeably.

ATA was designed to work with IBM's AT line of computers. It uses a 40-pin cable and plug that can accommodate two drives, a master (primary) and a slave (secondary). Basically, an ATA IDE socket is just an ISA bus slot that is specially modified for plugging in a hard drive cable. Because each drive has its own controller hardware, the computer sees it as a device on the ISA bus, just like a sound card or modem.

As anyone who has been alive in the past 20 years knows, the computer industry never stops advancing, and a few years after ATA's introduction, an improved version was developed, EIDE (which is also known as ATA-2); ANSI approved this new standard in 1995. EIDE eliminated some problematic hard drive size limitations and enabled faster data transfers of up to 16MBps (megabytes per second), which was double the speed of IDE/ATA. An additional two-device channel was added, raising the total number of possible drives to four. In addition, support for non-hard drive devices, such as CD-ROM drives, tape drives, and Zip drives was built in with the new ATAPI (ATA Program Interface).

Up to this point, whenever data was to be moved back and forth to system memory, the

External Speed vs. Internal Drive Speed

Although the huge data rate numbers of the newest EIDE and SCSI drives are certainly impressive, they aren't all that useful for the average user. On average, a UDMA/100 hard drive will not perform any better than UDMA/66, and probably won't be noticeably faster than a UDMA/33 drive. The reason is the internal speed of the hard drive itself isn't fast enough to keep up with the external interface speed.

As you can see, the most common hard drives (inexpensive 5,400rpm [revolutions per minute] models) don't yet require ATA/66 or even Ultra2/Wide SCSI speeds. The faster models do, however, benefit from the higher speed standards, but don't even approach the latest leaps of 100MBps or 160MBps. So why are such fast speeds even useful? There are two reasons: cache memory and multitasking.

The cache memory in modern hard drives is fairly large, usually 2MB or more. The larger the memory, the greater the chance of a cache "hit," meaning the requested information is found in cache memory. Cache memory is extremely fast; in fact, it's much faster than the drive's internal mechanical retrieval systems. (Significant delay is caused by the acts of drive heads having to move across platters and locate specific areas on them; fetching data from cache eliminates these steps.) If the cache is large enough and gets enough hits, the drive will actually perform much better than indicated.

A multitasking SCSI system with several drives or devices also benefits from a faster bus speed. Even if individual drives aren't able to keep up with the 160MBps maximum, several drives combined will definitely appreciate the extra elbowroom. □

Platter Rotations Per Minute	Maximum Internal Bus Speed
5,400rpm	15MBps to 25MBps
7,200rpm	25MBps to 35MBps
10,000rpm	30MBps to 40MBps

CPU had to supervise the task, which made an otherwise quick process somewhat tedious. This was known as PIO (Programmed Input/Output). When the CPU needed information, it asked the hard drive for it; then, the CPU waited while the drive searched its platters, found the data, and then sent it back over. When the CPU received the data, it stored it in RAM and continued its work.

EIDE, however, introduced DMA (direct memory access), which was a new way of transmitting data to and from the hard drive. DMA allowed the drive to communicate directly with RAM, needing little or no supervision from the CPU. This new development was revolutionary because it freed up CPU processor time, which allowed the processor to perform other tasks instead of sitting idle while the hard drive slowly chugged along (relatively speaking) while it searched for the requested data.

The next EIDE incarnation, UDMA (ultra DMA; also known as Ultra ATA or ATA-4), was a definite improvement over its predecessors. A new feature called command queuing was adapted from the SCSI standard to greatly improve the hard drive's performance in a multitasking environment. Command queuing allows a hard drive to accept several commands at once, process them, and send the requested data when time permits. In this way, the CPU can ask for data, perform other tasks, and then ask for more data without having to receive the first data from the hard drive. Other improvements were included, as well, such as the finalization and integration of the ATAPI standard, which allowed support for many other types of devices. However, as with most things related to computers, the best improvement was the speed increase; previously, DMA Mode 2 was limited to 16MBps, but UDMA/33 doubled this limit to 33MBps.

Today's EIDE standard is UDMA/66 (also known as ultra ATA/66 or ATA-5), which predictably sports a top speed of 66MBps. Additionally, UDMA/66 introduced **CRC** (cyclic redundancy check; a method of ensuring accurate data transmission. The sending device uses aspects of the data to be transmitted to generate a number based on complex formulas. The receiving device runs the same data through the same formula. If the two results do not match, the data must have been altered en route. In such cases the receiving device then asks for a retransmission of that data. Protocols that use CRC are more accurate but slower than protocols without error-checking.) to help avoid corruption of data to and from the hard drive. Even faster is the brand-new UDMA/100, or ultra ATA/100, which hits top speeds of 100MBps with no appreciable increase in cost.

■ **The SCSI Story.** With SCSI, each device has its own controller electronics built in, as with IDE/ATA drives. However, unlike ATA drives, which basically plug straight into the computer's data bus, the SCSI host adapter creates its own data bus that is separate from the computer's main data path. The SCSI bus doesn't communicate with any of the devices themselves, just with the SCSI controllers each one has built in. This way, you don't have to worry about which kind of device it is or whether it will be compatible with your system. If the peripheral has a SCSI controller on it, it will work as long as you have the correct drivers. Many SCSI hard drives are identical to EIDE hard drives, except they have an extra SCSI controller chip attached.

SCSI-2 is widely known today as "plain SCSI" because it is the standard the majority of low-speed SCSI adapters and devices, such as CD-ROM drives, scanners, and similar devices adhere to. The SCSI-2 specification also introduced speed-boosting features called Fast and Wide. The term Fast refers to a doubling of bus speed while Wide indicates the SCSI bus doubles in capacity to a width of 16 bits. The maximum speed for Fast/Wide SCSI-2 devices is 20MBps.

SCSI-2 also saw the introduction of command queuing. Command queuing allows the computer to send several commands to SCSI devices at once. When the device receives the commands, it stores them and executes them in the most efficient order while the computer continues with its other tasks. This greatly boosts speeds with multitasking systems that use SCSI, such as network file servers, because several users or programs can request information from the same device without bogging down the system as it waits for the data to be recovered. It also allows better use of the SCSI bus with multiple devices because the host adapter can send data to one device and then move on to another without having to wait for a response from the first one. (This activity is also known as "scatter-gather.") The adapter tosses out commands and data and then collects the responses as they come back, regardless of the order they were sent. This, along with synchronous communication (the ability to transmit and receive information at the same time), makes SCSI still the system of choice for multiuser and multidevice environments.

Ultra SCSI was the next standard to appear on the horizon. Also known as Fast-20, Ultra SCSI doubled speeds yet again, yielding 20MBps in 8-bit mode and a whopping 40MBps in Wide 16-bit mode. The next evolution, Ultra-2 SCSI, which is still commonly used today, again doubled the numbers, yielding a maximum 80MBps bus speed in Wide mode. Newest to the market is Ultra160 SCSI, which, you guessed it, boosts the maximum bus speed to 160MBps.

The standardization of SCSI-3 (features of which are already adopted in the Ultra SCSI series) will introduce a plethora of new command sets to integrate the strengths of new technologies such as Fibre Channel and protocols used with IEEE 1394 (FireWire). This gives SCSI adapters the power to interface with a whole new set of peripherals, such as digital cameras, as well as building the foundation for transfer rates of 200MBps and faster. The future definitely looks bright for SCSI. GS

by William Van Winkle

The SCSI bus doesn't communicate with any of the devices themselves, just with the SCSI controllers each one has built in. This way, you don't have to worry about which kind of device it is or whether it will be compatible with your system.

The Final Word

	EIDE		SCSI	
	Comments	Rating	Comments	Rating
Maximum Speed	100MBps		160MBps	
Number Of Connections	Four		15	
Variety Of Devices	Hard drive, CD-ROM drive, tape drive, removable drive		Hard drive, CD-ROM, tape drive, removable drive,scanner, printer,external hard drive, external CD-ROM drive, much more	
Reliability	Good-CRC error checking		Good-CRC error checking	
Expandability	Low		High	
Price	Affordable To Moderate		Moderate To Expensive	

Usefulness By Category Of User/Computer

	EIDE		SCSI	
	Comments	Rating	Comments	Rating
Network Server	Multitasking performance not up to par; limited number of drives		Great multitasking; large number of drives	
High-performance User	Good speed, but not many drive ports		Great speed; lots of expandability	
Midrange User	Better drives have plenty of speed but cost little		Lots of speed and features, but high cost	
Budget User	Low cost; large fast drives available		Cost prohibitive; multitasking and multidevice functions not likely to be used	

A Closer Look At Linux, The Operating System That Could

Mention the word Linux to several different people, and you're bound to get very mixed reactions. Some people will crinkle their nose and say they would never use Linux because they just don't understand it and fear they never will. Others will smile broadly and proclaim they would never consider using another OS (operating system). Then there will be those who stare blankly. Linux? What's that?

In this section, we'll acquaint you with the Linux OS, answering questions and addressing concerns tentative users may have about this software. Among other things, we'll explain what Linux is, how to use it for various tasks on your computer, and where to go for Linux help. We'll also discuss [illegible] the Windows OS and [illegible] around in one way or [illegible] Linux has yet to gain [illegible] users.

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[illegible] Learn How To Talk The [illegible]

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86 Preparing Your PC For Linux: The OS Scales Well But You May Need To Upgrade Components

70 Upgrading Issues: Answers To Common Installation Questions

74 The Calm Before The Storm: Preparation Is The Key Element Of Installing Red Hat 7.0

76 Installing Linux Red Hat 7.0: Take These Steps To A New OS

80 Getting Around In Linux: A Look At Two Graphical User Interfaces

82 Customize Your Linux Desktop: The Terminal Window & Graphical Interface Offer All The Power You Need

84 The Linux Network: Sharing A Dial-Up Connection To The Internet

88 Troubleshoot Your Linux System: Expert Advice To Help Solve Your Problems

92 Top Tools: What You Need To Work & Play On Your Linux System

96 Linux Online: Get The Help & Information You Need From These Online Resources

100 The Future Of Linux: Three Markets Hold The Key To Tomorrow

User, Meet Linux

Get To Know The Other Operating System

One popular phrase in the corporate community is "thinking outside the box." It simply means you should use new approaches and angles to try and solve problems or to create ideas.

In the computing community, thinking outside the box could be applied to the current buzz generated by the Linux OS (operating system) and the open source technology under which it was created. Linux and open source represent a major shift in thinking and approach from the commercial and proprietary software that has dominated many segments of the computing industry.

For those who are used to proprietary Windows-based computing, Linux and open source require you to do some readjustment in your way of thinking. Linux isn't going to be the perfect replacement for Windows in every computing circumstance, but it does deserve consideration for a variety of tasks.

■ **Linux Who?** Let's start with defining what Linux is. Like Windows, Linux is an OS. (This is one of the few things they have in common.) An OS is the software that runs your computer, allowing the hardware and software applications used on your computer to communicate.

Linux (pronounced LIN-nucks) is a version of the Unix OS, and it's built on open source technology. This means that the programming language is made public so that any programmer who wants to can make changes and improvements that can be shared with other users. (For more information on open source, see the "Open Source Technology" sidebar.) By comparison, Microsoft owns the basic Windows OS programming language, or kernel; it is not available to be tinkered with by the public.

Because its kernel is in the public domain, you can get Linux free of charge by downloading a version from the Internet or sharing it from someone's diskette. You don't have to be a programmer to use Linux, although the idea of open source is that everyone can contribute to the programming language to improve the software.

One of Linux's advantages is its ability to run on a large variety of computers. It's similar to Unix in this respect. Windows requires Intel architecture in the microprocessor. Linux, however, can run on IBM-compatible PCs, Macintosh computers, and PalmPilot handheld computers, among other microprocessor architectures.

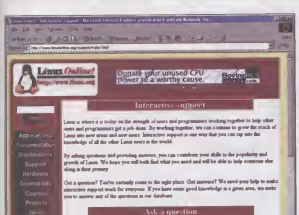
Another Linux advantage is its ability to evolve quickly. Because hundreds of thousands of programmers could be working on Linux at any one time, changes can evolve more quickly than with other OSes without the same resources. Industry experts predict Linux will be the first OS able to support a 64-bit microprocessor.

■ **Get Help.** Because no one person owns Linux, there is no single entity you can turn to when you experience problems. Several different Web sites have documentation for Linux though, and those who use and believe in open source technology and Linux will provide answers to some questions, usually on Web message boards. Before other users will address your questions, though, they expect that you've done plenty of homework on your own (such as reading the manuals and online documentation) in an attempt to solve the problem. Only after you've tried to solve the problem yourself will other Linux users be willing to help you, in most cases.

Some third-party companies, such as the highly publicized Red Hat, have stepped in to fill this void in on-demand technical support. Red Hat sells various versions of Linux bundled with hundreds of other open source applications that can be run under Linux. Red Hat also offers some technical support options and some printed documentation for Linux users. Other companies that sell similar products include Corel Linux, Caldera OpenLinux, and TurboLinux.

The Linux Online Web site (http://www.linux.org) contains a list of these types of companies and provides online documentation for using Linux. The site also contains a list of Web sites where Linux can be downloaded for free. Under the GNU General Public License, which governs distribution of Linux, companies can charge for copies of Linux as long as the source code is included or is made available to everyone who purchases the product. Linux is often referred to as a free OS but it's free more in the sense of programmers being free to make improvements, rather than always being free of charge.

■ **A Little History.** While many people might think the history of Linux began when



Support for Linux users, both new and experienced, is available from several Web sites, including Linux Online.

Red Hat made its initial public offering of stock in August 1999, its humble beginnings actually go back to Finland in 1991.

A computer science student at the University of Helsinki, Linus Torvalds, began tweaking a Unix-based OS called Minix in 1991. He released version 0.02 of his kernel in that year, and version 1.0 of Linux was released in 1994. Linux appears to be short for "Linus' Minix." (For more information on Torvalds, see the sidebar below.)

While Linux is based loosely on Unix, it offers several improvements, including a GUI (graphical user interface). Unix was a text-based, mouseless OS, but Linux offers a graphical system more similar to Windows and Macintosh.

Version 1.0 of Linux contained the most basic OS. But with the release of version 2.0 in 1996, Linux offered support for multiple microprocessors. The 2.2.16 kernel version is considered the most stable version at the time of this writing, although thousands of programmers are continually working with the kernel. Version 2.4 is expected sometime before 2001.

■ **The Linux Market.** How much do Linux and Microsoft compete for the same users? The answer to that all-important question

Linus Torvalds: The Man Behind The Penguin

Very few computer professionals are famous enough to become household names: Bill Gates, Steve Jobs, Steve Case, and Paul Allen come to mind first.

Another name may soon be joining them (it already has in many circles): Linus Torvalds. The Finnish computer programmer, who people usually refer to by his first name, is credited with the creation of the Linux operating system in 1991. Linus, who moved to the United States to accept a job a few years ago as a programmer with a chip design company called Transmeta, still oversees development of the Linux kernel.

Linus is described as a shy person who prefers spending time with his family and working on the Linux kernel rather than capitalizing on his fame in the computing community. For proof, we have to look no further than his decision to not accept a job after graduation with one of the Linux OS distributors, such as Red Hat. He probably could have become an overnight multimillionaire as a spokesperson for one of those companies, but he apparently didn't want to jeopardize his impartiality in developing Linux by being forced to bow to his employer's wishes when adding features to Linux.

Linus, who recently turned 30, told us in a recent interview that he never envisioned Linux becoming as popular as it has. In fact, he initially began work on the OS only for his personal use.

"It was not so much frustration with what was available as despair at what wasn't available," Linus says. "Basically there wasn't any decent operating system out there back in 1991 that was at all approachable to a technical person like me. The choice was basically between DOS and commercial Unix, one being too limited, the other being both too expensive and completely lacking in support for individuals. Not to mention hard to find in Finland. That, coupled with the fact that I'd been programming half my life, just led me to think, 'How hard can it be?' It turned out to be a lot more work than I expected, but by the time I found that out it was too late."

After posting his source code to the Internet in 1991, Linus asked a few other programmers to look at the code and give him feedback.

"So it started with me basically spending about half a year writing code, not doing anything but eating, sleeping, and sitting in front of the computer," he says. "It worked well enough for me that I wanted to show off a bit, and get some comments and ideas from people around the world. So I put it out on the Internet. The rest is history."

While Linux might seem like an overnight sensation to many people—especially those following the companies that have been created recently to sell versions of Linux—Linus says the growth of the OS has been a gradual process.

"Few people really realize that I, and others, have been working on it for close to 10 years, and that the apparent rags-to-riches thing has been a lot of work over long years," Linus says. "Don't get me wrong, it's been fun work, and in the end 10 years is a remarkably short time for it all, but it's certainly long enough that you have time to get used to the attention that grew up over time. Before you make it to the cover of *Forbes*, you go through a lot of steps in between, I can tell you." □

probably depends on whom you talk to. Some would consider Linux a free version of Windows—pitting open source technology against software giant Microsoft at the same time—but those who work closely with Linux seem to have a different agenda.

"Linux is not a replacement for Microsoft as a desktop system," says Michael Tiemann, Red Hat's chief technical officer. "A lot of people like to portray it as a David vs. Goliath situation. . . . But if all Linux were was a free version of Windows, would we really be improving anything? We must make new things possible."

As a matter of fact, Linux is far more popular on networks, Web servers, and with other types of Internet appliances than it currently is on desktop systems. Torvalds himself has said in recent interviews he hopes Linux never achieves the type of popularity and dominant market share Windows currently enjoys on desktop systems because he thinks such dominance isn't good for the industry as a whole.

This contented penguin, as drawn by Larry Ewing, is the most common mascot used to represent Linux.

"The Internet infrastructure represents a new application category where everyone had an equal starting point, and Linux has come along very quickly there," Tiemann says.

That doesn't mean Linux won't be as success on the desktop as an OS. In fact, no OS is growing in popularity for the desktop as quickly as Linux.

One of the keys to Linux's continued growth in popularity could be the development of

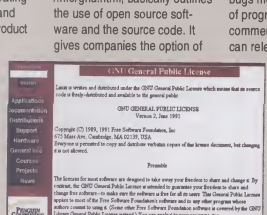
Open Source Technology

The idea of open source programming has been around since the beginning of computer programming: By collaborating with other programmers and sharing ideas, the final product is much better.

Some people feel the programming source code, or kernel, should be owned by the person who created it, who should then be able to sell the resulting software. This commercial software—where the kernel is protected—is distributed in binary form (a collection of zeros and ones), which a microprocessor can read but humans can't decipher. While hundreds of companies create and sell commercial, or proprietary software, Microsoft is the best-known company of this type.

Open source software is distributed in its native programming language, allowing any programmer to decipher it and make improvements, repairs, and additions.

The GNU General Public License, created in 1989, governs the distribution and use of open source software. The license, which can be read in full at http://www.linux.org/info/gnu.html, basically outlines the use of open source software and the source code. It gives companies the option of charging a fee for an open source software package when they distribute copies or provide technical support or warranties.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Preamble
The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public License is intended to guarantee your freedom to share and change free software--to make sure the software is free for all its users. This General Public License applies to most of the Free Software Foundation's software and to any other program whose authors commit to using it. (Some other Free Software Foundation software is covered by the GNU Library General Public License instead.) You can apply it to your programs, too.

The GNU General Public License, created in 1989, governs the distribution and use of open source software.

To consider source code as open source, the code's author must agree to the GNU General Public License.

Open Source Debated.

Open source proponents say they enjoy several advantages over commercial software.

For instance, because thousands of programmers could be working on any particular open source software package at any time, they can find and fix bugs more quickly than a group of programmers working on a commercial software package can release a patch to fix a bug. Another benefit is that open source software is improved on a continual basis, giving you the benefits of new features immediately, rather than having to wait for a new version of commercial software to be released.

Because the vast majority of open source programmers are volunteers though, some people question the long-term success of such software. A volunteer group might jump from project to project with little loyalty to finishing one project or to developing upgrades once the original project is finished. Then there's the problem of the volunteers needing to work at their paying jobs, limiting the time they can spend on open source projects.

So far, these worries haven't manifested themselves as problems for open source programs. Open source programmers have been extremely dedicated to their various projects, especially to Linux. And many companies looking to hire top programmers have had to promise to give the programmers time to spend on open source projects.

Even though open source programmers aren't paid for their work, they do receive some personal benefits. They receive notoriety throughout the programming community, which may help them obtain better jobs or consulting positions. By seeing how other programmers tackled certain problems with the source code, they can become better programmers too.

But the enjoyment of creating a great program and of receiving praise from their peers is the best incentive for the best open source programmers.

"A big part of personal satisfaction is having your work recognized by your peers," Linux creator Linus Torvalds said in a recent interview. "That's fundamental in any human psyche." □

WINE Daily Builds for Linux (And FreeBSD!)

[Stripped vs. Unstripped | Why Use these builds? | What made the builds | Downloading and Installation]

Quick Info

WINE is a Windows emulator available for Intel based Unices (Examples: Linux, FreeBSD, NetBSD, OpenBSD, Solaris). People have also undergone efforts to port WINE to OS/2 and ECO Unix.

Here you can download WINE binaries. WINE is normally distributed in source code from the WineHQ Homepage. It is strongly recommended that you download the source code and compile WINE. However, some people don't have the time to download it or compile. For those people, these binaries could be a good TEMPORARY solution.

What's the Difference Between "stripped" and "unstripped"?

Two types of wine binaries are offered on the site, Stripped and Unstripped. Stripped WINE binaries are a little less than 4.5 MB, while unstripped ones are around 20 MB. Unstripped binaries include "debugging symbols", allowing you to point your debugs to the WINE newsgroup and get help from developers. If you use the stripped binaries, DO NOT Post single messages to the WINE newsgroup merely saying that your application doesn't work. That helps no one. If you need to make a bug report, download an unstripped binary (if you didn't already) and take a look at

The WINE Daily Builds For Linux site is a good place to start if you're interested in using software designed exclusively for use under Windows on your Linux system.

Wine, or Windows emulation. Through Wine, software designed exclusively for use under Windows can also be used under Linux. As users are able to keep more of the software packages with which they're already familiar, chances are more of them will be willing to make the change to Linux. For more information on Wine, check out http://panter.soci.aau.dk/~dailywine.

■ **The Penguin.** You may be wondering why Linux uses a penguin as its mascot. In several Internet postings on the subject, Linus says he fell in love with penguins during a trip to Australia and felt like it would be the perfect mascot for Linux.

While some people have questioned the penguin, saying it doesn't capture the essence of Linux or doesn't appear commercial enough, Linus says he thinks it's perfect. He says the mascot is meant to be fun, rather than serious.

"Some people have told me they don't think a fat penguin really embodies the grace of Linux, which just tells me they have never seen an angry penguin charging at them in excess of 100 mph," he said in an Internet posting. "They'd be a lot more careful about what they say if they had."

■ **The Right Moves.** A penguin moves slowly but steadily on land. Given the right underwater environment, however, a penguin moves quickly. Linux may mimic the land movement of its mascot for a few more years, slowly growing in popularity, but once the right computing environment for it exists, we could see the penguin move into the OS forefront very quickly. GS

by Kyle Schurman

Is Linux For You?

Trying to decide whether Linux is a better fit for your computing situation than Microsoft Windows or another operating system isn't an easy choice. Here are some of the benefits and drawbacks to using Linux on a desktop.

Pro: Linux needs far fewer system resources than Windows. When running Linux, you should notice immediate improvement in your hardware performance and stability versus Windows.

Con: Linux isn't as easy to use as Windows. Linux doesn't automate several aspects of computing for you, as does Windows. You need to be a little adventurous and willing to try some system tweaking to receive many of Linux's benefits.

Pro: Linux is far more flexible than Windows. If you need a special feature for your operating system, chances are good you'll find it with Linux. If it doesn't exist, you can create it yourself if you have the programming knowledge.

Con: You sometimes must switch software packages. Some Windows-based software packages won't work on a Linux operating system. However, parallel software products are available that are open source packages, meaning they're free. Some Windows software can run under Linux through Windows emulation, too.

Pro: Linux is free (or almost free). You could pay $100 or more for a Windows-based operating system; Linux can be downloaded for free or purchased for only a few dollars when packaged with other software.

Con: Installation of Linux can be difficult. When you install Linux, you must create partitions. You also may need to reformat your hard drive. Creating partitions can be an extremely difficult procedure and will be enough of a hassle to drive away some potential users.

Pro: Linux offers much stronger security measures than does Windows. Because of its Unix background, Linux allows you to protect files from tampering when others are using your PC.

Con: Linux users must enjoy reading documentation manuals. If you don't like to read the (usually) boring documentation manuals to find information on how to perform various computing tasks, you'll probably want to pass on Linux. The Linux community is willing to provide answers to computing questions, but you'll almost always be asked first whether you have read the manuals.

Linus' Take

Is Linux the right choice for everyone's desktop computer? We asked the creator of Linux, Linus Torvalds.

"Nothing is right for everyone," he says. "And quite frankly, most people don't like their computer, and the absolutely last thing they ever want to do is to change the OS that they hate but have gotten used to.

"So don't expect people to switch in droves. These things take a long time, and 10 years have gotten us to the point where people see that Linux is a major player, and that people are seriously considering the possibility of Linux being the major player some time in the future. But that will take more time. Do I believe it can happen? You bet your shorts I do. Is it inevitable? Probably not. But Linux does have a lot going for it, and while especially the desktop market is the hardest market for an OS to enter, yes, Linux certainly has a chance.

"Will it happen next year? No. But Linux will be a bit bigger next year. And the year after," he says.

The Language Of Linux

Learn How To Talk The Talk

The Linux community has a language all its own. If you're a new Linux user skimming through a Linux magazine or surfing Linux-related Web sites, you'll quickly realize that to truly understand Linux, you'll have to learn the Linux jargon. We think this will help.

■ **If You Can't Say It Right, Don't Say It At All.** An appropriate term to start with is Linux itself. The proper pronunciation of the name of this OS (operating system) eludes many new users. Some pronounce it LEEN-nux or LINE-nux, but most people say it with a short i: LIN-nux, so it rhymes with cynics. For more information on Linux itself, read "User, Meet Linux: Getting To Know The Other Operating System" on page 56 of this issue.

■ **Working Out The Technicalities.** Before we get into the terms concerning the workings of Linux, we should look at some of the terms you should be familiar with when considering using Linux. For example, is the OS as stable as everyone proclaims, and is it really free?

Copyleft. Linux has always been (and continues to be) free, open source software. This freedom is protected under the GNU General Public License, which prevents Linux from being turned into proprietary software, or software that someone can claim exclusive rights to. The term "copyleft" gives users the right to free Linux software and the right to modify the software. To read more about the GNU General Public License and open source, check out http://www.opensource.org/osd.html and http://www.gnu.org/gnu/thegnuproject.html or read "User, Meet Linux: Getting To Know The Other Operating System" on page 56 in this issue.

Crash Free? One of Linux's often-touted characteristics is its stability. This means that systems running Linux don't crash very often. As you can imagine, this is a great feature when it comes to setting up a server. Linux advocates often boast that Linux systems can run for a year or longer without locking up and requiring a reboot. This may be music to the ears of users tired of losing information and time because of system crashes.

Distros. If it's free, why is there a charge for it? You can actually download and install the Linux kernel (the heart of the OS, more on this later) for free, but it can be a hassle to install. So several companies offer the kernel in customized, commercial distributions, or distros, of Linux. There is only one Linux standard but there are several (at least 16) distributions of Linux, all of which use the same kernel source code.

Each distro is a little different, depending on configuration, included software and documentation, and ease of installation. While some distros (such as Mandrake) have a reputation for being easy to use, others (such as Rock) revel in the fact that they are more customizable and hence more difficult to configure and use. Slackware is reportedly a good choice to install on laptops. Red Hat is probably the most widely known distribution; it deserves a lot of the credit for all of the attention Linux has received in recent years. Some distributions are geared more toward the desktop environment, while others are preferable if you plan to start up a Web server.

■ **OS Components.** The three parts of an OS (such as Linux) are the file structure, the kernel, and the user interface.

File structure. The Linux file structure, much like the Windows file structure, consists of hierarchical directories. Each directory (what Windows calls folders) can contain other directories or files. One difference between the DOS and Linux directory syntax is that in Linux, the root (top) directory in the file system is represented by a forward slash (/) instead of the back slash (\) used in DOS.

Kernel. The kernel of any OS is the core computer code of that OS. It is the part that loads first, and it stays in the main memory.

The kernel generally manages the memory, processes and tasks, and disks. You should keep a backup copy of your kernel file in case your system develops a problem. To do this you'll need to know the name of the kernel file, where it is located, and what version of the kernel you have. In the case of Red Hat Linux, the name of the kernel is vmlinuz (plus the version number). The file should be located in the /boot directory.

The kernel's version number consists of three segments, for example 2.2.17. The first number, known as the major number, changes only when there are major changes in the kernel. The second number is called the minor number, and it corresponds to minor changes. The third number is called the revision number. If the revision number is an odd number, it is an unstable development release that contains the newest (not necessarily bug-free) features. The revision number increases as patches that fix bugs are released. If the revision number is an even number, the release is a stable one, meaning that the bugs have been fixed.

Once your OS is up and running, you will want to periodically update the kernel as newer versions come out. The two main reasons for upgrading the kernel are: 1) the new device drivers (which allow the OS to communicate with hardware devices) and 2) the bugs that are fixed. In addition, new versions of the kernel might be faster and could be more stable.

User interface. The user interface is the means by which the computer and the user communicate. With Linux you have several choices, including: KDE (K Desktop Environment) and GNOME (GNU Network Object Model Environment). KDE is an open source desktop that includes a windows manager, a file manager, and several applications such as a Web browser and mailer. The KDE interface (http://www.kde.org) will also be very familiar to Windows users. GNOME is the standard GUI (graphical user interface) for Red Hat Linux. GNOME consists of a panel, or long bar at the bottom of the screen from which the user can easily start programs, a desktop, a file manager, a Web browser, and other GUI tools.

The international Linux community is very generous when it comes to providing information and assistance, especially to new Linux converts, but try to exhaust all available resources on your own before seeking help.

Linux Commands. Taking off on your first Linux voyage is like launching a new ship. You will most likely get where you are going without wearing a life preserver, but it's probably not wise. If something goes wrong, you could be in trouble. Likewise, Linux command line commands can sometimes serve as your life preserver when things go wrong with your Linux system. Newer distributions of Linux make it less likely that you'll ever need to use command line commands. However, you need to learn a few Linux commands so you can use them in case your boat starts taking in water.

The Linux command line looks a bit different than the standard DOS prompt. Linux can use many different shells, but the default shell is BASH (Bourne Again Shell). Many different shells have been developed for Linux, but BASH is the default. A shell interprets the commands entered on the command line and sends those commands to the OS for execution. BASH uses a dollar sign ($) as its prompt.

The Linux command syntax can be intimidating unless you are pretty familiar with DOS syntax. The Linux command structure in BASH is as follows: $ command [options] [argument]. The option and argument (in brackets) are optional, meaning that depending on what command you are giving, you may not need to include an option or an argument. Options to Linux commands are usually denoted by a minus sign (-) followed by a single letter (a). For example, to view hidden files, add –a to the ls command (for list) like this: ls -a. If you just want to move or rename a file, you would type mv after the $ prompt.

Linux commands are often similar to their corresponding DOS commands. Sometimes the commands are identical; such is the case of cd (for change directory). Often the Linux command is even shorter than the corresponding DOS command. The Linux command cp works like the DOS copy command. To find out what version of the kernel is installed on your Linux system, you can type this command: rpm –q kernel. To reboot your Linux system, type reboot or shutdown –r. When it's time to shut down your system, type shutdown –h now.

Software & Utilities For Linux. One of the reasons that Linux has been slow to catch on in the mainstream is that there haven't been as many applications designed to run on Linux as there have been for Windows, but that is changing. Many commercial distributions of Linux include a number of free applications.

The GIMP (GNU Image Manipulation Program). The GIMP stands for GNU Image Manipulation Program, and it is Linux's graphics tool package. You can use GIMP for, among other things, retouching photos and creating and editing images. Tux, the penguin who is the Linux mascot, was designed using GIMP.

RPM (Red Hat Package Manager). The Red Hat version of Linux comes with the RPM (Red Hat Package Manager), which is used to install or uninstall software designed to run on Linux. An RPM package is an archive containing all of the program files, data files, configuration files, and documentation for

One of the reasons that Linux has been slow to catch on in the mainstream is that there haven't been as many applications designed to run on Linux as there have been for Windows, but that is changing.

Most people who decide to install Linux won't want to dedicate their entire computer to it right away.

If you want to try Linux in addition to the OS you currently use, you can partition your hard drive.

a particular software application. The RPM software package acts as an application's installation program.

Tape archiver (tar). Tar is a utility that compresses information to a file archive. Tar can also extract information from an archive. The tar command archives to and extracts files from a file with the .tar extension, which are usually called tar files. Tar doesn't actually compress the file; it takes a second command to compress it (compress or gzip). You will know if a file has been compressed if it has one of the following extensions: .tar.Z, .tar.gz, or .tgz. Many compression utilities for the PC (PKZIP for example) can unzip (untar) a tar file.

Vim (VI Improved). Vim is an improved version of vi, which is a text editor for Unix systems, such as Linux. Vim is a vi clone supplied with Red Hat Linux.

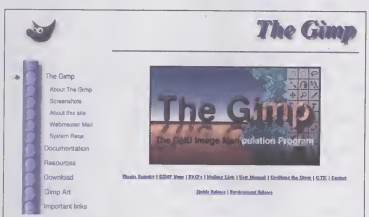
Wine (Windows emulation). If you want to try Linux while still running your Windows applications, you can do so with Wine software. By using Wine, you can use software that was designed for the Windows system on your Linux system. This means you can use the software you're already familiar with when trying out Linux. Wine is downloadable and distributable (in accordance with the GNU license). However, if you are a novice Linux user, you may want to avoid Wine unless you absolutely need or want to try it. Wine is still in the development stages, so it may still be unsuitable for general use.

X Windows. X Windows is a GUI alternative to the command line interface that you can use to interact with Linux. It has windows, menus, and icons—everything you are used to working with in other GUI OSes such as Windows.

■ **Other Important Linux Terms.** Here are some are terms you will encounter as you dive into the Linux community.

Apache Web server. With every distribution of Linux, you receive all the files you need to install a fully functional Apache Web server, which will let you store and send out Web pages. Many Web servers in commercial operation today are Apache Web servers.

Daemon. Daemon (pronounced DAY-mon or DEE-mon) is a Unix/Linux term for a process that runs in the background, performing actions at a specific time or in response to some command. An example would be lpd, a print spooler, which puts print jobs in a buffer while the printer catches up.



If you want to learn more about the GIMP, Linux's graphics application, you can do so at the GIMP home page.

LILO (Linux Loader). Most people who decide to install Linux won't want to dedicate their entire computer to it right away. If you want to try Linux in addition to the OS you currently use, you can partition your hard drive. Partitioning a hard drive involves breaking up the storage space of a single drive into sections (partitions), each of which can contain a different OS. This means you can run both Windows and Linux on different partitions of the same hard drive.

When you turn on a computer with a partitioned hard drive, you will need to tell the computer which OS to launch. That's where the boot manager comes in. A boot manager is a program that lets you choose which OS you want to start when you have more than one installed.

LILO is the most popular boot manager for Linux, and it is used to start Red Hat Linux, DOS, Windows, or some other OS you have installed. LILO is also used to load Linux into memory. Incidentally, even if you don't have multiple OSes on your machine, Linux requires that you partition your hard drive. The Swap partition is used for the virtual memory, the Root partition holds files necessary for booting the system, the Usr partition is where applications will be installed, and the Home partition is where users save their files.

Root. The root (or root user) is the superuser or administrator account on a Linux system. This is the only account with the authority to do everything, including create users. If you are the root user on your Linux system, make sure you remember the password for the root user's account. You'll need to log in as the root to do most important tasks. However, for security reasons, you won't want to log in as the root user all the time.

Samba. Samba is included with most Linux distributions. This software lets a Linux system connect to a Windows network. With Samba, a Linux server can operate as a server for a network of Windows machines.

■ **Intimidated By A Penguin?** The international Linux community is very generous when it comes to providing information and assistance, especially to new Linux converts. If you run across additional Linux terms or ideas that have you stumped, turn to the Web or written resources for help. Then don't hesitate to ask fellow Linux users.

For an exhaustive list of online Linux resources, check out "Linux Online: Get The Help & Information You Need From These Online Resources" on page 96 in this issue. GS

by April Hardison Boud

Your Linux

Find The Distribution Flavor That's Right For You

If you're looking for Linux, you'll find there are a number of distributions available for download on various Web sites and from organizations that have developed their own tailored versions. Some of these releases are free while others cost a nominal charge or request a donation. You'll also find packages that include the Linux distribution on CD-ROM, but be aware that more included applications usually means an increase in price.

While you're perusing the Web reading information about the different Linux distributions, consider the quantity and quality of documentation that is included with the package. Also, look at the number of additional programs that are supplied and whether you will use them. Prices vary, but you may find a number of rebates available.

Although it may appear that companies giving away Linux distributions are offering a great deal, you may find they charge a premium price for any after-market support. If you think you'll need this help, the cost of it should be a major factor in your decision-making process when choosing your distribution.

A number of companies that sell packaged versions of Linux offer as many as 60 days of free technical support. This is important because problems often crop up in the installation stage due to hardware or compatibility issues. Once those issues are resolved, you may not find a need to call for product support. However, it is more likely that you will need ongoing support if you're installing Linux on a server rather than just on your home computer.

A number of Linux distributions worth considering include Red Hat Linux, Caldera OpenLinux, SuSE Linux, Stampede GNU/Linux, and Debian GNU/Linux. However, there many other distributions available, and a search of the Internet can produce a number of Web sites that are worth checking out. Keep in mind that each distribution offers slightly different features and requires different hardware specifications. The table on the next two pages provides some details of a few of the different Linux distributions that are presently available.

Who owns Linux? As you have been reading in this section, nobody owns Linux. Because it is an open source application, many different Linux versions are available, but compatibility between those versions cannot be guaranteed. Therefore, we don't recommend mixing applications intended for different Linux distributions. This will help reduce the possibilities of any potential problems.

What You'll Find. The Linux distribution you need depends on your individual needs. You'll find different options depending upon whether you're installing it on a file server, a home computer, or one that you're using in a business environment.

For example, Caldera and SuSE offer two different editions of Linux. Look for a "server" edition if you're going to install Linux on a file server and a "professional" edition if you're a business or professional home user. A server edition usually allows multiple users access to applications and files over a network and provides other user-management functions. A professional edition commonly offers single-user access and includes limited networking features. Make your choice wisely because installing a server edition on a home computer or single business computer would slow down the computer's performance and not offer you any advantages.

Other Linux distributions, such as those from Red Hat and Corel offer a quality version of Linux with many features that home users and business users require. These include a Web browser, e-mail application, and some security features.

Before you install Linux. If you purchase your Linux distribution from a company that offers support and updates, provides quality documentation, and has a Web site where you can download updates and patches, you are assured that once you have installed your Linux, you can continue to expand and add additional functions and hardware later. Be sure you review this documentation before you start.

Next, check to see which kernel the Linux distribution uses. The **kernel** is the main part of an operating system that handles the most basic but most important tasks. All Linux distributions indicate the kernel versions they use, and this is important for compatibility reasons. Some beta versions of kernels are available online, but users have not accepted these as stable, so we don't recommended using them.

Companies such as RedHat, Caldera, Corel, and a few others state which applications their Linux distributions will be compatible with. Whether you are using a major suite or a piece of shareware, you need to make sure the distribution you're considering will allow you to continue to use these programs.

No matter which distribution of Linux you decide to purchase and install, you can be certain the operating system is here to stay. In the future, standardization should secure its presence further, and as more users and organizations accept and adopt Linux as an alternative operating system to Microsoft's Windows, it will grow in strength and popularity.

by Phil Thompson

Which Linux Is Right For You?

You may have heard variety is the spice of life, but when it comes to your operating system, you want to know exactly what you're getting into. Here, we've collected some of the most popular Linux distributions on the market and what you can expect from each.

Distribution	Company Information	URL	Price	Key Features
Armed LinuxWorkstation beta 1.1	Armed.net is an Austin, Texas-based organization made up of a small group of professional developers. Armed released the first version of Armed Linux in September 1999.	http://www.armed.net	Free through download from the Armed site, or it is availeble on CD-ROM (price not listed as of this writing)	• Armed Linux is intended for first-time users and people who want to use Linux as a secondary operating system to Windows. • This release of Linux is in its final beta stage and has received many favorable reports stating thet it bridges the gap in the Linux market for releases that ere suitable for the first-time novice user.
Caldera Linux Technology Preview	Ransom Love and Bryan Sparks founded Caldera in 1994, and in 1998, Caldera Systems was created to develop Linux-based business solutions. Based in Orem, Utah, Calder Systems provides Linux-based products for businesses through its OpenLinux line.	http://www.caldera.com	$39.95 (with $20 rebate)	• This distribution features the new Linux 2.4 kernel and the latest C/C++ Linux development tools. • Provides the OpenLinux platform and key resources for developers and corporate IT professionals who want online information to enable them to write applications to run on OpenLinux and Java. • This distribution is for the developer and not recommended for the novice user.
Debian GNU/Linux 2.2	Debian GNU/Linux 2.2 is dedicated to the memory of Joel "Espy" Klecker, a Debian developer who, unbeknownst to most of the Debian Project, was bedridden and fighting e disease known as Duchenne Muscular Dystrophy during most of his involvement with Debian. The Debian project is run completely by volunteers.	http://www.debian.org	Free	• Supports the Intel, Alpha, Motorola 680x0, Apple PowerPC, SPARC, and ARM (used in some portable and handheld computing environments) architectures, which is more than any other distribution. • Debian GNU/Linux 2.2 offers automatic network setup and is based on the latest stable Linux kernel (2.2.16).
DLX	The DLX edition of Linux has been developed by academics and is distributed in source code only because of the different kernel setups users may have.	http://www.wu-wien.ac.at/usrh93/h9301726/dlx.html	Free	• Full-featured Linux system for computers that use Intel processors. DLX boots from one 3.5-inch diskette with an older kernel, version 1.3.89. This version starts a RAM disk image on bootup. This is when the computer uses all of its available memory to store files. The advantage of using a RAM disk is speed because files load quicker from memory than they do from the hard drive.
Linux-Mandrake7.1	Linux-Mandrake 7.1 is developed by MandrakeSoft, which just signed a content provider partnership with AvantGo to offer the latest Linux-Mandrake news on PDAs.	http://www.linux-mandrake.com	$29.95 (Essential And Complete) $55.95 (PowerPack And Deluxe)	• Linux Mendrake is a complete preconfigured graphical Linux operating system. It's easy to install and use and is stable. Plus, it's compatible with Red Hat. • Designed for novices who want to migrate from the Windows environment and for those who don't want to spend too much time installing and configuring their Linux operating system. • The Essential And Complete pack comes with 40 applications, which include: Adobe Acrobat Reader 4.05, the StarOffice 5.2 office suite, Corel WordPerfect 8, and RealPlayer 7. • The PowerPack And Deluxe edition contains all of the applications Essential And Complete does, but it also comes with an additional CD-ROM with even more third-party applications.
Linux PPC 2000	Milwaukee-based LinuxPPC started developing Linux distributions for Macintosh PowerPCs in 1996. The company made its biggest splash with LinuxPPC R4 in June 1998. It followed that release with LinuxPPC 4.1, 1999 (5.0) and the present release, LinuxPPC 2000 (6.0).	http://www.linuxppc.com	Free, but the company accepts donations	• LinuxPPC is for the Macintosh PowerPC.The company dealt a blow to Windows 2000 in the recent LinuxPPC Security Challenge, in which a Power Mac 9500 running LinuxPPC bested a 500MHz Penitum III running Win2000.LinuxPPC features a graphical partitioning tool, fast-loading installer, direct booting, and bootable CD-ROMs.

Distribution	Company Information	URL	Price	Key Features
LinuxWare 2.5	When TransAmeritech released LinuxWare 1.0 in 1995, the company set a new standard for configuring an easy-to-install version of such a complex operating system. Since then, TransAmeritech has revised the OS and the present version, 2.5, is now available.	http://www.trans-am.com	$35	• This version of Linux is simpler to install than other versions because it is geared toward the beginner or home user who is getting starting with Linux. The installation is straightforward and doesn't require very much user intervention. In addition, installation is compatible with Windows 3.1 and Windows 95. • Includes a Web browser, e-mail client, word processor, and database and spreadsheet applications.
Plug And Play Linux	Yggdrasil is the name of the world tree in Norse mythology. The roots of Yggdrasil reached into the underworld, and its branches supported the heavens. This symbolism is intended to illustrate the mission of Yggdrasil Computing to provide infrastructure to support the free software world.	http://www.yggdrasil.com	$25	• This distribution uses the stable Linux 1.2.13 kernel and also has source code for the experimental 1.3.15 kernel for more adventurous programmers. • Plug And Play Linux comes on two CD-ROMs; the first includes all system programs while the second CD-ROM is source code. • This distribution is aimed at more experienced computer users who may want a version of Linux to develop and tailor to their own needs.
Red Hat Linux 7.0	Founded in 1994, Durham, N.C.,-based Red Hat is the leading provider of open source Internet infrastructure solutions, which range from small, embedded devices to high-availability clusters and Web serving.	http://www.wccdrom.com	$29.95 $79.95 (Deluxe Workstation) $179.95 (Professional Server)	• Partitionless installation lets you install this version on a DOS or Windows PC without altering partitions. • The update agent automatically downloads and installs software updates from the Internet. • Improved RAID (redundant array of inexpensive disks) support means better performance and easier administration of RAID devices. • Red Hat 7.0 also comes with 128-bit encryption for secure Web communication, USB support for mice and keyboards, and a graphical firewall. • The Deluxe Workstation edition comes with: a full version of StarOffice 5.2, a demo version of Applixware 5.0, and Adobe Acrobat Reader 4.05. • The Professional Server edition comes with: a full version of Novell eGuide 1.01, Veritas NetBackup 3.4, a full version of StarOffice 5.2, a 30-day trial of Applixware 5.0, IBM DB2 Universal Database Personal Developer's Edition, and Computer Associates ArcServeIT.
Slackware7.1	Slackware Linux was developed by Patrick Volkerding, David Cantrell, Logan Johnson, and Chris Lumens. Volkerding founded Slackware Linux and has worked for many years developing Linux versions. After graduating college in 1993, he soon released his first Slackware version, 3.3. You can download Slackware 7.1 off one of Slackware's FTP sites or get it on CD-ROM from the Walnut Creek URL supplied here.	http://www.wccdrom.com	$39.95 ($49.95 with printed manuals)	• Slackware 7.1 offers a range of development tools that allow more advanced users to tailor the distribution to their own needs. The package also comes with Internet-ready applications, such as a browser and e-mail program. • This distribution is intended more for advanced users or at least those who have previous Linux experience. Although the Web site does provide basic information about the various Slackware versions, a novice user may require more support and assistance.
Stampedeversion 0.90	Stampede Linux is the result of a collaboration of programmers, some of whom have left their names and details on the Stampede Web site. However, there is a great deal of quality information available on the site.	http://www.stampede.org	Free	• Stampede Linux is optimized for Pentium processors, but it is not recommended for novice users. Instead, Stampede is ideal for the advanced user who wants to tailor it for personal needs. It is being constantly improved and developed by the team of dedicated enthusiasts that originally created it. • Support for Stampede is available through an e-mail link on the Web site.
SuSE Linux7.0	Founded in 1992 by four German software engineers, SuSE is the oldest major Linux provider. Today, SuSE has an international presence with offices all over the world.	http://www.suse.com	$39.95(Personal) $69.95(Professional)	• The Personal edition comes on three CD ROMs, and includes the Quick Install Guide, Applications Manual, Configuration Manual, and a boot diskette. • The Professional edition comes on six CD-ROMs and one DVD and has more than 1,900 applications.

Linux Hardware

The Platforms That Make Linux Tick

While anti-Microsoft renegades may long to see Linux take on giant Microsoft in the consumer market, that confrontation hasn't taken place. Instead, Linux has found a niche as the OS (operating system) of choice for a growing number of Internet appliances and servers, and some analysts estimate that Linux-based servers alone will account for roughly $4 billion in revenues by 2003.

Linux is finding success in the server and appliance arenas because it is essentially free. While Windows NT and other operating systems require sometimes-hefty licensing fees, developers find Linux eminently affordable. Second, developers have access to the Linux source code, which makes it flexible; if necessary, developers can actually modify the OS, rather than being forced to find ways around problems or shortcomings. Finally, Linux is small; developers talk about the footprint of a system, or how much space it takes up. WinNT's footprint is huge, which results in large memory requirements and sometimes-sluggish performance. Linux, however, really is lean and mean. And the developer is free to pare it down even more if it's not quite lean enough.

The net result is that more and more developers are using Linux and similar open-source OSes to power consumer-oriented game machines, Internet appliances, and servers. And because of Linux's flexibility and the absence of significant licensing fees, you'll find that many of these machines are less expensive than you may have thought.

The IR7200, a set-top box from Coollogic is being marketed to ISPs rather than to consumers.

Indrema's L600 is a sophisticated game console that can also surf the Internet in style.

FrontPath's ProGear is fast and stylish.

■ **Nothing But Internet.** The introductions of the first set-top boxes were accompanied by a lot of hype, and some analysts heralded the end of the true PC. It hasn't happened and likely won't in the foreseeable future. PCs have become too sophisticated, and too many people rely on them to do too many things; users who need heavy-duty word processing, spreadsheets, and other such business and consumer applications aren't about to give up all of that power just so they can surf the Internet or play a game.

But what about those folks who want only to surf the Internet? Or send e-mail? What about someone who would really rather not bother with OSes, application setups, or complicated programs? For those people (and there are millions of them in the U.S. alone), simple PC-like appliances, many of them powered by Linux, may be just the answer.

Remember that there are dozens of these machines available; they range from $200 to $1,500 and this is not an exhaustive listing. However, the appliances we'll discuss are impressive and mostly affordable. Start by taking a look at these if you're in the market.

■ **Internet & Game Appliances. The Coollogic IR7200.** The Internet Ready 7200 uses your television as a display. It comes with a wireless keyboard and can be upgraded remotely. The company says that the IR7200 is "...designed to emulate those features typically found on a Web-enabled PC, but without the complexity."

Interested in purchasing one? You can't. At this time the IR7200 is being marketed only to ISPs (Internet service providers) and can be "private branded" by them. So, while you may find an ISP who will possibly provide the box as part of its service at no charge, for now you won't be able to pick one up at your local electronics store.

The Indrema L600. The Indrema is scheduled for release in the spring of 2001 and may be the Cadillac of affordable Internet and game appliances. For $300 you get a very stylish unit that contains a 600 MHz processor, 64MB of memory, the Gecko browser and e-mail package, and a built-in MP3 player. According to Indrema president John Gildred, at least 30 games will be available by the time the L600 ships, and the appliance will allow you to surf the Internet via a 56Kbps (kilobits per second) dial-up, a DSL (Digital Subscriber Line), or a cable-modem. Indrema wants to do everything possible to help developers build games and other applications for the L600.

The NIC. Oracle chief Larry Ellison is behind the bare bones, 266MHz New Internet Computer. At $199 the NIC is an inexpensive alternative to a PC, is bundled with Netscape Navigator 4.7, and features the ability to connect to the Internet via an onboard 56Kbps modem or through a network, DSL, or cable-modem. It also includes 64MB of RAM, two USB (Universal Serial Bus) ports, and a keyboard and mouse. What's missing? A monitor. You can supply your own, or you can purchase a 15" SVGA monitor from NIC for $129.99. Unlike some similar devices, the NIC does not require any kind of membership, and you're free to use your own ISP if you wish.

Frontpath's ProGear. If Indrema's L600 is the Cadillac of such appliances, then the ProGear must be the Dodge Viper. The $1,500 Web tablet is not for everyone; and it's not meant to be. The ProGear is not a game machine. This unit is a serious information appliance and is currently being sold only into vertical markets: corporations, research groups, legal and medical practices, to name a few. But you're going to want one after you see it fully loaded with a bevy of features such as a 400MHz Transmeta processor, a 10.4-inch touch screen, handwriting recognition software, 64 or 128MB of RAM, a

USB port, a PCMCIA slot, and a keyboard. FrontPath says they'll begin shipping in the U.S. early in 2001.

■ **Server Appliances.** The other niche in which Linux has found a home is in low-end server appliances. One of these tools, which mostly run right out of the box, may be just what you need if you have a small home or business network or if you plan to host a small Web site or intranet.

The NetWinder OfficeServer. The OfficeServer from Rebel.com looks like a high-tech, thin-line speaker enclosure. It's not. It's a serious office server, which can host up to 100 simultaneous users, handle e-mail and Internet access, and according to the company, will run right out of the box. At $1,795 for the desktop model, the OfficeServer supports dial-up, DSL, or cable-modem.

Cobalt's Qube 3. As befits its name, Cobalt's entry into this market is a simple blue cube. Beneath its plain exterior lies a no-nonsense server that is ready to host a Web site or an intranet and can handle up to 150 simultaneous network users. Starting at $999, the Qube 3 comes with Apache, a Web authoring package, and a discussion group manager, so it's ideal for Web hosting. Add a router, and you can be up and running in less than an hour. (*NOTE: Cobalt recently purchased Progressive Systems, the company that makes the Phoenix firewall appliance, a product you may be interested if you're setting up a network and are looking for an out-of-the-box firewall. But Sun Microsystems then snapped up Cobalt, so the future of Progressive Systems is up in the air as we go to press.*)

Rebel.com's OfficeServer is a small, sleek turnkey network-in-a-box.

The Office Elf. Greencomputer Innovation's Office Elf is another cubelike appliance. GCI touts its easy setup and says that the Elf can be up and running "in the time it takes to have a coffee." This $1,799 network-in-a-box provides Internet access and hosting, file and print sharing, firewall, and POP3 (Post Office Protocol 3), SMTP (Simple Mail Transfer Protocol), and IMAP (Internet Message Access Protocol) e-mail services. Furthermore, the Elf can also run in server-only mode if you already have a firewall.

■ **Fast, Flexible & Free.** Let's face it: Windows has grown into a useful and usable OS, but it's big, slow, and expensive. In other words, it's exactly what Linux is not. The result is that you'll begin seeing Linux and similar Unix-like, open-source OSes on more and more boxes. And it may be most prevalent where you won't see it: embedded in systems that require speed and flexibility.

Running invisibly inside turnkey server appliances and Internet boxes, Linux enables developers to provide robust, inexpensive solutions to complex problems. If you're looking for such tools, the examples discussed above are a great place to start, but don't stop here. For more info on Linux and on Linux-based appliances, check out the following Web sites: http://www.linux.com, http://www.linux.org, or http://www.thelinuxstore.com. GS

by Rod Scher

Get A Firewall

You need a firewall if you're setting up a network and intend to connect that network to the Internet. Not having one means that you leave your entire network open to any hacker who wants to dig around in your server. And if the workstations are left on (as often they are), a hacker can get through the server and into the individual computers. (For more information on security issues, see "Keep Your Computer Secure & Information Private" in Smart Computing Learning Series: PC How Tos, October, 2000, Vol. 6, Issue 10.) A firewall acts as a choke point by controlling traffic as it travels between your server and the Internet. Most firewalls also utilize a technique known as "packet filtering" to examine incoming packets and decide whether or not to pass them through. Many of Linux-based server appliances noted here include firewalls. You will need to buy a separate firewall if you purchase (or already own) one that does not, especially if you're going to hook your network up to the Internet. The products listed below will get you started.

Company	Product	Comments
Progressive Systems http://www.progressive-systems.com	Phoenix Adaptive Firewall	$895; Linux-based; simple setup; very secure, using adaptive state analysis in addition to NAT and packet filtering.
D-Link http://www.dlink.com	DI-701	$115; supports up to 32 users
SonicWALL http://www.sonicwall.com	SonicWALL SOHO	$495 for 10 users
NETGEAR http://www.netgear.com	RT311 Gateway Router	$180 for up to 10 users; actually a router, but with NAT
WatchGuard Technologies http://www.watchguard.com	WatchGuard SOHO	$449 for 10 users

Preparing Your PC For Linux

The OS Scales Well, But You May Need To Upgrade Components

Linux is a powerful OS (operating system) that offers all the features available in other competitive OSes, but it adds the advantage of scalability. Linux will find a good home on new computers, but if you're planning to use the OS on an older one, you can make a few simple hardware upgrades to install a version of Linux. We'll tell you what you need to join the Linux revolution and include information about CPU architectures, component specifications, and drivers.

■ **Strength In Flexibility.** Linux scales very well to almost any computer system, so unlike other OSes and applications, the level of hardware specifications isn't much of an issue. Linux was the brainchild of Linus Torvalds, a Finnish computer programmer who intended to make Linux freely available to everyone. Linux's **source code** (the language of instructions the computer needs to perform the functions the software dictates) is open. Open source code is freely available to programmers so they can edit, tweak, and produce a revised release of that software. Programmers can then freely distribute the new version under a general public license so other programmers can improve that version. This form of software development is the key to Linux's scalability, making it possible to tailor it to individual needs and to the majority of computer specifications.

Although Linux will work on most systems, the computer's hardware specifications play a role in how well the software works. Every system must meet the minimum hardware specification requirements; otherwise the software will either not install or not operate. The three key components that affect all software are the processor your system uses, how much memory it has, and the hard drive's capacity. Other components play a role, but they aren't as important.

Supported CPU architectures. One of the great things about Linux is that it supports a number of different processing platforms. Thus, if your computer uses a CPU other than an Intel Pentium, chances are Linux will run on it. Other supported architectures include Alpha, Motorola 680x0, Apple PowerPC, Sun Microsystem's SPARC, and ARM (used in some portable and handheld computing environments). The processor you have shouldn't affect the Linux installation process; however, we suggest checking through the different Linux **distributions** (versions of the Linux OS; because no one company owns Linux, several companies have developed Linux versions that are targeted toward different users and are available on CD-ROM with extra software and hardware drivers) for the supported architectures before settling on any particular one. In addition, not all Linux distributions support the variety of architectures we've mentioned.

■ **Upgrading For Linux.** If your system does not meet the minimum requirements, you will need to upgrade. The good news is that it may not be necessary to go out and buy a whole new computer because you can upgrade three specific components. However, you should carefully consider what you upgrade and the specification of the replacement component.

(*NOTE: For more about upgrading your computer and the steps you need to take to do so, visit our Web site at http://www.smartcomputing.com. Click the Purchase Or Review Past & Current Issues link, click Review An Issue, and then take a look at our Guide To PC Building and Guide To Upgrading issues.*)

Hard drive. Your system's hard drive plays a key role by storing the OS, programs, and user data files. The size of the hard drive and the amount of free space available affects the OS's speed. As the hard drive fills up, files become fragmented and the system operates slower.

The hard drive is also home to a large number of temporary files that the OS uses; these temporary files are stored on the hard drive to save RAM space. Having an adequately sized hard drive is important not only to store all the OS files, applications, and data files but also to maintain a stable system and to allow future expansion of the computer with the addition of new applications and software upgrades.

RAM. The quantity of memory in the system will control how many applications you can open at any one time. If you have more memory installed, you can keep open more programs without affecting the system's performance. Increasing memory also means the system can reduce the number of temporary files stored on the hard drive. Every OS has a minimum and an optimum RAM requirement. Once you install the optimum amount of

memory, increasing the memory will have little to no effect on the OS's performance.

CPU. Having a high-powered processor installed in your system will increase the overall speed of the system, but you won't see the main benefits unless you are doing graphic or numeric-intensive tasks. Such tasks would include rendering 3-D graphical images.

What do you need? The specification requirements of different Linux distributions vary slightly, but the average computer in use today should be more than adequate to support any distribution of Linux.

For example, Red Hat Linux 7 requires a minimum of 2GB of hard drive space and 64MB of RAM to operate satisfactorily. If you have anything less than a 233MHz processor, you will find running any applications will be hard work. TransAmeritech Systems' LinuxWare (http://www.transam.com) requires a minimum specification of an Intel 386 or faster processor, 8MB of RAM, and 25MB of hard drive space. LinuxWare also supports SCSI (Small Computer System Interface) CD-ROM drives, 8- and 16-bit sound cards, and fax modems. Walnut Creek CDROM's Slackware Linux 7.1 (http://www.cdrom.com) specifies a minimum CPU specification of an Intel 386, but it also will work on systems with an AMD Athlon or Cyrix processor. Slackware Linux 7.1 requires 500MB of hard drive space and a minimum of 16MB of RAM, but it will work best with 64MB.

■ **Peripherals.** It is always a good idea to check out whether there are drivers available for the peripherals you have on your system. Drivers are programs that allow hardware peripherals, known as devices, to communicate with your computer's OS. Your sound card, printer, scanner, modem, CD-RW (CD-rewriteable) drive, or any other peripheral needs a driver so it can function under the new OS. Although Linux scales very well to lower-specification PCs, if you can't find a driver that matches the device you have installed, you may need to consider upgrading that device.

■ **Recommendations.** If you are buying a new computer and intend to install Linux for the first time, all the new computers that are presently available on the market will meet the minimum requirements. However, be sure to examine the system's upgrading options so you can further enhance the system's performance.

Depending upon what you want your Linux system to do, you may need to open your computer's case to add RAM or upgrade the hard drive.

As a rule, you can never have too much memory installed in a computer. Most computers today come with a minimum of 64MB of RAM installed, with the option of increasing that to 128MB for enhanced performance. If you intend to use your Linux system for graphical tasks, such as 3-D modeling or photographic work, you'll need a fast CPU. Many new computers today come with 700MHz CPUs, with the top-of-the-line models coming with 1GHz CPUs. A 700MHz CPU is adequate for the majority of home-computing tasks and graphics work, but business users who intend to do serious graphical work should go with the 1GHz chip. In addition, for graphics work, you should consider increasing the RAM to 256MB.

If you intend to save large files, such as video clips, sound files, or photos for editing, you should get at least a 20GB hard drive. Hard drives with this kind of storage capacity have come down in price and are now quite economical. If you intend to just use your computer for some simple word processing, then a smaller hard drive in the region of 10GB should be more than adequate.

If you're going to use the system as a file server (a computer on a LAN [local-area network] that provides network users access to shared data and program files), it should have at least an 800MHz CPU, a 20GB hard drive, and a minimum of 512MB of RAM. The size of the hard drive is determined by how many users will be accessing the network and whether each user is intended to have an allocation of space on the server for saving files. Likewise, a fast processor is essential if the server is to keep pace with the demands of all the users.

Although you must ensure your hard drive meets the minimum specification required for a particular Linux distribution, you should consider the applications that you are going to install and their required storage space. Take some time to think about the work you intend to do on the computer and whether you are going to save it to the hard drive. Some installations of Linux only require 25MB to 500MB of hard drive space, but you should plan on keeping another gigabyte free for OS patches and upgrades, applications you want to install, and data-storage space. This means at the minimum, you'll need a 2GB hard drive.

You can use an old 486 system as long as it meets the minimum installation requirements sufficient for your Linux distribution. However, for better performance, you should try to increase the amount of RAM as much as possible. Upgrading the CPU and hard drive may be difficult, depending on the availability of components that will work with your older motherboard, as well as the specifications of the other components already inside the computer.

For corporate and small-business environments, you need to consider your network devices. Devices such as network cards, routers, and hubs need to be compatible with the Linux distribution you're installing.

If you're not purchasing new equipment to install Linux on, you should formulate an installation plan. This should detail all the devices that you have installed on your system together with possible sources of drivers. In addition, make a checklist that details the specification of your existing system compared to the minimum and recommended requirements of the software you intend to install.

Be sure to include details of any problems you think could be encountered, as well as possible solutions. Ensure that any software or drivers required are available and compatible with the hardware you have and the Linux distribution you're attempting to install. Finally, the most important task of all, back up any important data files from your existing system prior to starting any upgrade or installation. GS

by Phil Thompson

Upgrading Issues

Answers To Common Installation Questions

As a highly adaptable, free operating system for Internet servers, Linux has existed in relative obscurity for nearly a decade. But now that corporations have begun adopting it as a mainstream server OS and companies such as IBM and Dell have begun factory-loading it on certain servers, desktops, and notebooks, many users are asking themselves if they should install Linux on their systems.

If you are considering installing Linux, there are a few things you should know before you get started. The good news is Linux can run side-by-side with your existing version of Windows, but you won't be able to run it from within Windows. Because Linux is an operating system, it runs in place of Windows, so you'll have to start the computer separately each time you want to run it.

If you install Linux properly, it won't overwrite any of your Windows files or affect the functionality of your existing system, but it can allow you to access its files. However, assuming you have the hard drive space, you'll need to install separate programs that run under Linux because none of your existing Windows applications will work.

In other words, you can play with Linux until your heart is content. In fact, you can even customize it using the source code that is included with every copy without jeopardizing a single byte of your existing software.

■ **The First Step.** The first thing you'll have to decide is which Linux version you want to install. Unlike Windows, Linux comes in a variety of versions, called distributions, each of which is produced by a different developer. Each distribution is built on the basic Linux core, or kernel, but features enhancements that each creator develops. These enhancements, which include such features as Internet access or a graphical environment, make Linux much easier for the average person to use.

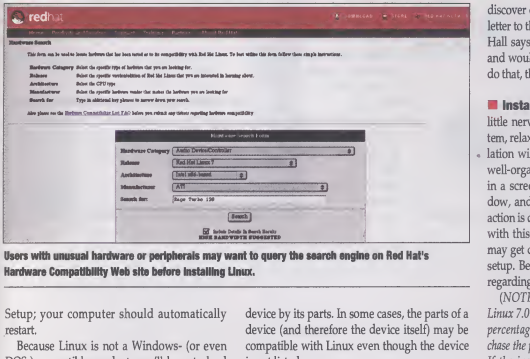
We recommend Red Hats Linux 7.0 (http://www.redhat.com), which the company released this fall. Red Hat is the most popular Linux distribution and has received numerous excellence awards. (Because we recommend Red Hat 7.0, all the instructions and information in the remainder of this article are specific to that distribution of Linux.) You'll also need to decide which variant of Red Hat 7.0 to install. Although you can download it for free from Red Hat's Web site, we strongly recommend you pay the extra $29 and purchase the boxed edition to get the software on CD-ROM and the full printed documentation.

If you think you'll be using Linux on a regular basis and you need office productivity software, purchase Red Hat's $79 Deluxe Workstation, which comes bundled with Sun Microsystems' complete office suite, StarOffice. As an added bonus, the Deluxe Workstation version includes 30 days of telephone installation support and 90 days of Web-based installation support. (The standard version of Red Hat 7.0 comes with 60 days of Web-based support, but no free phone support is provided.) If you don't want the extra support, you can download StarOffice for free from Sun (http://www.sun.com/products/staroffice/get.html) and save yourself the $50.

■ **Hardware Compatibility.** Red Hat Linux will run on all x86 processor systems (286 and faster) that have 32MB of RAM and 500MB of hard drive space. For optimum performance, however, Red Hat recommends you install its OS on a Pentium-class computer with 64MB of RAM and 1.2GB of hard drive space. Red Hat supports AMD (Advanced Micro Devices) Athlon and K6 processors, as well as Intel's CPUs.

The system you install Red Hat Linux on to must have a bootable 3.5-inch diskette drive (usually set as A:) or CD-ROM drive (usually set as D:), and your **BIOS** (Basic Input/Output System; a piece of software built into your system that controls the startup process and other basic functions, such as the keyboard, display, and disk drives) must be set to boot from one of these drives before it boots from the hard drive (usually set as C:). If you are not sure of your boot order, start your computer and look for the keys to press (usually Delete or F1) to access you computer's BIOS Setup screen.

Next, look for an option called BIOS Features Setup or BIOS Setup and then Boot Order or Boot Sequence. Highlight that item and toggle through the various options until you locate one that says, "checks CD-ROM and/or A before C." Save the new configuration and exit



Users with unusual hardware or peripherals may want to query the search engine on Red Hat's Hardware Compatibility Web site before installing Linux.

Setup; your computer should automatically restart.

Because Linux is not a Windows- (or even DOS-) compatible product, you'll have to load new drivers for your peripherals because none of the Windows ones will work. Fortunately, Red Hat Linux comes packaged with all the drivers you should need to support the major product lines of basic components, such as Sound Blaster sound cards (Creative Labs), RAGE (ATI) and Millennium (Matrox) video cards, and others.

"Unless you have a brand-new machine that you bought in the last month, with a very new video card, you shouldn't have problems," says Red Hat Vice President of product engineering Erik Troan. "Your keyboard, mouse, sound card, and video card should work right out of the box." (Factory systems are more likely to be compatible than those that were custom-built.)

Regarding add-ons, Troan says Red Hat supports both the USB (Universal Serial Bus) and AGP (Accelerated Graphics Port; for video cards) specifications. It also supports Ethernet connections and 100% Hayes-compatible modems, Iomega Zip and Jaz drives, SCSI (Small Computer System Interface) cards, and many printers and scanners (but not all). If you have very new or unusual components on your system and you want to find out if you will encounter problems, visit the Red Hat Hardware Certification Web site (http://hardware.redhat.com/redhatready/cgi-bin/us/db-hcl.cgi) and search for your devices from among a listing of compatible products.

If a device you simply must have (or you're not willing to replace) is not listed, Red Hat can walk you through breaking down the device by its parts. In some cases, the parts of a device (and therefore the device itself) may be compatible with Linux even though the device is not listed.

For assistance with solving questions that relate to devices that are not shown as compatible, visit the Hardware Compatibility List FAQ Web site (http://hardware.redhat.com/redhatready/cgibin/us/genpage.cgi?pagename=faq). For information about identifying the components of a particular device, visit the Hardware Identification HOW-TO (http://hardware.redhat.com/redhatready/HOWTO/hardware/production/hcl.html).

If you can't find a favorite device listed and it doesn't work after you install Linux, you should check back frequently because Red Hat constantly updates the device list. Once the device makes the list, contact the device manufacturer to obtain the new driver.

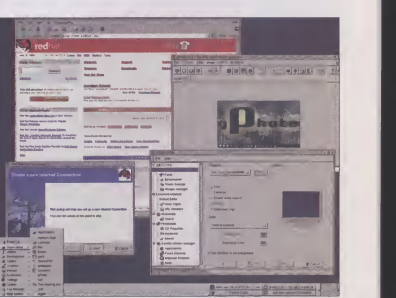
Jon "Maddog" Hall, who is executive director of Linux International (an association of companies that promote Linux), recommends users contact the manufacturer immediately if they discover devices that are not supported. "Send a letter to the marketing director [of the product]," Hall says. "Tell them you are a Linux advocate and would like a driver. After about 500 people do that, they might write one."

Installation Considerations. If you're a little nervous about getting Linux on your system, relax because we're here to help. The installation wizard provided with Red Hat Linux is well-organized and helpful. Actions take place in a screen on the right-hand side of the window, and help information that relates to each action is displayed concurrently on the left. Even with this excellent setup utility, however, you may get confused during certain elements of the setup. Below, you'll find our recommendations regarding the major options you will encounter.

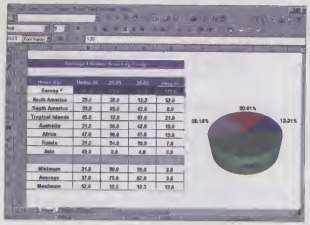
(*NOTE: At the time of this writing, Red Hat Linux 7.0 still had several bugs that affected a small percentage of installations. By the time you purchase the product, those bugs will likely be resolved. If the installation hangs at any point, you'll be prompted to save the error message to a diskette. Visit the Red Hat errata Web site at http://www.redhat.com/support/errata and you should be able to download the necessary fixes.*)

Initial startup. The core of Linux is command-line based, like DOS. During the installation process, Red Hat Linux installs a graphical foundation, called X Window. This forms the core for the GUI (graphical user interface), which is the desktop environment you also will install during setup.

When you boot your system using the Red Hat Linux CD-ROM, the software will present



During installation, you're allowed to choose your desktop environment. GNOME (shown here) offers a Windows-like interface that supports multiple windows.



StarOffice, which comes bundled with Red Hat 7.0 Deluxe Workstation, is a full-featured office productivity suite with an interface that Microsoft Office users will find very comfortable.

you with a text-based welcome screen that offers you the option of choosing a graphical or text-based installation (in addition to a repair and expert modes). A graphical installation is the default, so press ENTER or wait a few seconds and the graphical installation will begin. If you do not want to run Linux with a desktop environment, choose the option for a text-based installation.

Initializing setup. After you choose an installation mode, Linux will run a probe during which it attempts to identify your basic equipment, such as the keyboard, mouse, peripheral cards, etc. During this process, dozens of strings of text will scroll quickly across the screen. This is normal; wait for the process to complete and the graphical setup screen will appear.

Mouse configuration. If Linux does not recognize your mouse (which is rare), a screen that says "Mouse Not Detected" will appear. If this occurs, proceed to the next screen to provide your mouse information. You also can choose to use text mode to perform the installation. Linux can run without a mouse, but working in the desktop environment is much less enjoyable without mouse support. As a result, it will be in your interest to resolve mouse conflicts (or purchase a new mouse) before proceeding with the installation.

If Linux does recognize your mouse, it will confirm the information several screens later in the installation. If you have a two-button mouse, the software will offer you the option of emulating a three-button mouse. Linux's desktop environment works best with a three-button mouse, so you should select this option, which will enable you to press both mouse buttons to simulate the presence of the third button.

Install types. At the start of setup, the software will ask you which type of installation you want to perform. We recommend Windows users choose Custom, which allows you to control the partitioning of your drive, enables you to perform a partitionless installation, and provides you with the ability to customize your applications. If you are going to keep Windows (or another OS) on your system, do not choose Server because it will completely erase and reformat your entire hard drive for use with Linux.

Passwords and accounts. The system will prompt you to supply a root password and create at least one user account. "Root" in Linux is the master account and it is extremely susceptible to accidental tampering. Set up as many nonroot accounts as you want, and plan to use at least one of them for normal operation.

Package groups. Package groups are like program groups in Windows, but they also include the two available desktop environments, GNOME and KDE. You can install either desktop environment or both and switch back and forth from one to the other from within Linux. KDE is a standard for many Linux distributions, but Troan recommends new users install GNOME, which supports the use of multiple windows. To install both environments, you will need 1.7GB of available hard drive space.

If you want to decide which components to install, click Select Individual Packages. If you use this option, be sure to install the X components, which form the basis of the graphical environment.

Monitor selection and video card configuration. In order to function properly, X Window must configure first your system's monitor and then its video card. If your monitor is not listed or your video card is not detected during the user-prompted probe operation, Troan says the problem is most likely with a video card incompatibility. You can manually identify the characteristics of your monitor and video card, but Troan advises you to choose a resolution (and amount of video memory) that is equal or lower to that of your equipment. Choosing a monitor or video settings that your equipment can't handle can damage or destroy your monitor.

After video configuration and testing is complete (you'll be asked to confirm legibility for the current configuration), the setup program will install Linux on your system. Once installation is finished, the software will prompt you to create a boot disk, which you'll need if you are booting into a partitionless installation.

After completing this operation, insert the boot disk (if you are booting into a partitionless installation), restart the system (remove the installation CD-ROM as soon as the reboot starts), and you're ready to start working with Linux.

■ **Explore Your Software.** Many have accused Linux of being inadequately represented in the software market. Although you will find that the hottest games aren't yet available for Linux, there is a wealth of software available for the OS. Of course, don't expect to find your favorite Microsoft applications.

Netscape Communicator, which you can use to browse the Internet, send and receive e-mail news messages, and create Web sites, comes with all boxed versions of Red Hat 7. In addition, Red Hat 7 comes with GIMP (GNU Image Manipulation Program), which is a robust image editor that allows you to create, manipulate, and enhance digital photographs, scanned images, and computer-generated artwork.

GIMP is superior to Windows Paint because it offers a number of features, such as layers, blur/sharpen filters, and a cloning tool, which are usually found only in expensive graphics programs. Using GIMP, you can create sophisticated graphics that you can import Netscape Composer (Communicator's Web builder) and use to enhance your own Web pages.

If you purchased the Deluxe version of Red Hat Linux, you will have received a fully functional version of StarOffice, which offers sophisticated word processing, database, spreadsheet, presentation, graphics, and event management functions. A Windows version of StarOffice is presently available as a free download from the Sun Web site, so you can install it if you want to transfer StarOffice files to your Windows environment.

A number of additional software titles are also available for Linux. For more information, please refer to "Top Tools" in this issue.

■ **Word On The Street.** We spoke with several users who use both Windows and Linux on the desktop to give us their thoughts about using the two operating systems. Their comments about Linux were quite positive, but you have to take them with a grain of salt because they were also quite biased. (Few people use Linux on the desktop unless they want to because it is virtually unknown as a desktop solution in the corporate arena. This makes these users Linux boosters by default.)

The most objective comments we found came from user Thomas Phipps, who is a "tech room supervisor" for a small computer company in Las Vegas. "Installation, in my opinion, is a breeze. Just put in the bootable CD-ROM, boot the computer, answer the questions, and wait. Most Linux distributions install everything right the first time and understand when something is installed at a later date. [Linux is] much simpler than Windows, at times, for beginners."

However, Phipps did admit Windows is more user-friendly than Linux (although he personally prefers the command-line orientation of Linux) and he lamented the lack of driver support, which he said would take "a miracle" to resolve. As a final suggestion for Windows users, he says, "Don't be afraid to ask Linux gurus questions; we will answer them. Linux and Windows really are very different beasts meant for different situations." GS

by Jennifer Farwell

The Partition Question

Prior to the release of Red Hat Linux 6.2, Windows users who wanted to run Linux on their existing systems were forced to create a separate space, or partition, on their hard drives for Linux. Partitioning a hard drive is not complicated, provided you do so on an empty hard drive. However, once you store data on a hard drive with a single partition, it is not possible to carve an additional partition out of the remaining space without either reformatting the drive or using a third-party application.

Fortunately, the newest release of Linux Red Hat, version 7, offers a simpler alternative. With this version, you can perform what is called a partitionless install. Red Hat Vice President of product engineering Erik Troan recommends this method for users who are testing the Linux waters.

"Coexisting with Windows is really easy using this method," Troan says. "Rather than create a separate partition, during installation the system will reserve a certain amount of your Windows file system for Linux. The entire OS will be contained in two files. If you want to remove Linux from your computer, all you do is go into Windows and erase those two files."

Troan says using this method results in a performance penalty of 5%-10%, so you shouldn't use it "if you are running a real production system." He says for most users, though, the solution is ideal. "The only disadvantage is that you have to boot Linux off a [diskette]. If you install into a separate partition, Linux appears as a boot option that you select on your computer each time you start the system."

Partitioning For Linux.

If you have a new drive or one that has already been subdivided into partitions, you can install Red Hat Linux into its own space on your hard drive. This will give you the best performance, and it will allow you to dual-boot Linux. At startup, you will have the option to select either Linux or Windows as your operating system and you won't need a boot diskette to start Linux.

If you have an unformatted partition on your system, Linux will detect it during setup and will automatically partition and format that space for use with Linux. The automatic partitioning feature in Linux will not overwrite existing Windows drives and partitions.

If you have multiple formatted drives or only one drive, Linux's included Disk Druid utility will not perform automatic partitioning. If you have only one drive, you will need to proceed with a partitionless installation (see below), unless you want to completely erase and repartition your hard drive.

In the case of multiple drives, you can use either Disk Druid (recommended for novice users) or FDISK (recommended only for expert users) to delete the partition and reformat the space. However, you need to be aware that this will erase all the data on the drive. Disk Druid will not recognize your old drive letters, but the first drive listed should be your system drive. If you are not certain which partition you want to delete, consider proceeding with a partitionless installation. If you accidentally delete the partition that contains your Windows installation, you will have to reinstall Windows and possibly repartition and reformat the drive.

If, during setup, you are not certain about the partitions on your system, choose Custom when the installation wizard asks you to select a system type. Disk Druid will display information about all your partitions so you can decide how you want to proceed.

Partitionless Instali.

In order to install Linux in an existing partition, your hard drive must have at least 900MB of available space and a DOS FAT (file allocation table) file system. This is the file system Windows 95 and Widows 98 use; if you are running Windows NT with NTFS (NT file system), you will not be able to use this method.

When Disk Druid opens, choose to edit a partition. A window will appear asking you to name the partition and specify its size. Label the partition "/" (which indicates root). By default, the size will be half the space available on the drive. If you will not need the remaining space on the drive and want to install applications under Linux, you may want to increase the space.

The system will ask you to confirm your choice and warn you of the speed penalty. Click Yes to continue with the standard Linux installation.

The Calm Before The Storm

Preparation Is The Key Element Of Installing Red Hat 7.0

- ✓ Is this something you really want to do?
- ✓ Check your hardware for basic requirements.
- ✓ Check your components for compatibility.
- ✓ Think about your software.
- ✓ Write down an inventory of your system.
- ✓ Get Linux.
- ✓ How are you going to install?
- ✓ How are you going to boot?
- ✓ Start the installation.

So, you've decided to install Red Hat Linux 7.0. Let your more unenlightened friends call you a geek, and let Bill Gates stew in that gazillion-dollar house of his. After all, you're about to jump on one of the biggest waves to hit computing in some time.

Now it's time to gear up for the slightly more difficult part. Before you get started, there are some points to consider, a few plans to make, and some miscellaneous preparations to undertake. Linux is a grown-up now, and you don't have to be a true-blue computer freak to get it up and running on your system. On the other hand, unless you have a bunch of friends who are familiar with Linux and its inner workings, you'll probably be hoeing this row alone. In other words, measure twice and cut once. Here, we've compiled a checklist of points you need to consider before you begin your installation. After reading this, you'll be ready for the rest of the articles in this section.

1 Is this something you really want to do?

Setting up any operating system, whether it's Windows or Linux, is not a cakewalk. You might encounter problems, and to solve them you'll need to do a bit of reading and perhaps some research on the Internet. It helps to have a Linux guru on hand or at least the phone number for one. Failing that, you should do some research ahead of time with publications such as this one and keep them within reach.

We don't mean to dissuade anyone from giving Linux a go. If you like to tinker with your computer a bit, if you're interested in open source software, or if you're involved in the computer industry or want to be, Linux is for you. On the other hand, if you just use your computer for e-mail, some word processing, and little else, Linux probably isn't for you—at least not yet.

2 Check your hardware for basic requirements.

Generally speaking, you'll need at least 120MB of free hard drive space when all is said and done for a minimal installation, but 450MB allows you to set up the standard workstation-class installation. Also, be aware that the installation procedure itself uses up to 900MB temporarily, so you may have to clear out some space. Unless you're seriously low on storage space in these days of multigigabyte hard drives, you probably have what it takes. In addition, Red Hat recommends at least 16MB of RAM, but as always, more is better. Finally, you can install the OS (operating system) on a machine that runs on a blazing-fast Intel Pentium III, an old pokey Intel 486SX, or a variety of other CPUs (central processing units).

3 Check your components for compatibility.

Besides meeting the minimum system requirements, you'll also want to make sure Linux is compatible with the particular components that combine to make up your machine. Although Linux now supports most hardware, "most" does not mean "all." For example, if there is no Linux **driver** (a program that allows a hardware peripheral to communicate with a computer and its OS) available for your video card, you may have trouble even seeing what you're doing.

Red Hat maintains an extensive list of hardware compatibility data at http://hardware.redhat.com. Follow the links to the search form and use the pull-down menus to figure out if Linux will be agreeable with your components when the last subroutine falls into place. If your hardware isn't listed as compatible, try a search at the freshmeat.net software site (http://freshmeat.net), where the newest in Linux is posted daily.

4 Think about your software.

Along with your hardware, another consideration to factor in is your software. Basically, none of the software you own written for an OS such as Windows can be guaranteed to run under Linux. Experimental software lets you run some Windows packages on Linux, but it is far from the final release stage. You can try out some of these programs at Wine Development HQ (http://www.winehq.com).

If you're going to **dual-boot** your machine (create one hard drive partition that runs Linux while having another that runs another

OS), the software issue is not such a big deal. However, if you want to have a Linux-only machine, you face the task of migrating your data from one set of programs to another. You can find many free word processors, Web browsers, calendars, and other such programs that run on Linux, but it won't always be easy to make the transition if you use your computer for more than simple tasks.

5 Write down an inventory of your system.

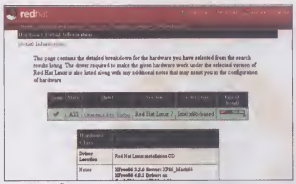
Now it's time to take a full inventory of your system's components. Red Hat's installation routine should be able to automatically identify all the parts rattling around inside your machine, but just in case things go wrong, you're going to need a pretty good picture handy. Generally, you'll need to find out the make and model of nearly every piece of your system, from the monitor down to the hard drive. If you're on a network, you also will need to find out information such as your IP (Internet Protocol) address, server addresses, domain name, and host name.

To find out what kind of system information you'll need to know, check out Red Hat's table at http://www.redhat.com/support/manuals/RHL-7-Manual/install-guide/ch-table.html. Print it out and fill in the blanks. If you don't have all the information already written down or don't own software that figures it out for you, try the comprehensive free Belarc package at http://www.belarc.com/Download-auto.html. If Belarc doesn't detect one of your system components, you'll need to find out the hard way, so open up the case or find the original manual.

6 Get Linux.

You're now ready to get your hands on the actual software. Linux software is widely available in a variety of formats, but the easiest option for new users is to buy the official CD-ROM box set from Red Hat, either in your local software store or online from the Red Hat Web site (http://www.redhat.com). At about $30, this is also the most expensive option. However, Linux doesn't have to cost you anything; you can download all of Red Hat Linux for free, and the Internet is full of "how-to" instruction articles.

If you've decided to go the downloading route, check out Red Hat's How To Download page at http://www.redhat.com/download/howto_download.html. Once you've taken a gander at the size of the files involved, you may want to reconsider skipping the official CD unless you're connected to the Internet through a high-speed cable or DSL (Digital Subscriber Line) modem. The whole kit and caboodle for Red Hat these days fills two CD-ROMs, which means downloading files that consume more megabytes than you want to know. It's also possible to download a different version of the software if you want to load directly from a hard drive; just make sure you're getting the right one.



The Red Hat hardware compatibility database lets you know whether you're going to have any trouble on the way to Linux happiness. Look up your own system components to see whether Linux drivers are available.

Another possibility is to pick up a copy of Linux on a CD-ROM that is included with one of the many Linux tomes lining bookstore shelves. One thing to watch out for here is that you're getting the newest version of the software, which in this case is Red Hat 7.0.

7 How are you going to install?

The primary method for installing Linux today is from a bootable CD-ROM. Most new computers allow you to boot right off the CD-ROM drive, but this won't be possible on older machines. If that's the case with your computer, you'll need to use a boot diskette. A boot diskette is included with the official Red Hat boxed set, or you can make your own by following the instructions at the Red Hat Web site (http://www.redhat.com/support/manuals/RHL-7-Manual/install-guide).

If you downloaded your copy of Linux, you may instead choose to install it off of your hard drive. To start off the process, you will still need a boot disk or a PCMCIA (Personal Computer Memory Card International Association) boot diskette for mobile computers. Check out the Red Hat site for details for making your own.

8 How are you going to boot?

One of the most complex aspects of setting up Linux for the first time can be partitioning your hard drive. If you're going to run a Linux-only machine, you don't need to worry much about the whole partitioning business. However, if you still want to be able to use another OS, such as Windows, you'll need to reorganize your hard drive a bit so the two (or more) OSes can leave in peace as good neighbors. You can do this before installation or as part of the installation process.

Usually, Linux can handle sharing your PC with other OSes pretty well if it is given a separate partition. The one exception is Windows NT/2000. If you want to dual-boot with one of these OSes, you will need to load Windows before Linux and be aware there are special steps to follow to make sure WinNT continues to work once Linux casts its spell.

If you plan on resizing or splitting your Windows partition, you should prepare the drive by cleaning house. First, empty out the Recycle Bin and delete any other extraneous files hanging around. Then, run ScanDisk (click the Start button, select Programs, click Accessories, and look in System Tools). Finally, run the Windows Defrag program to rearrange the data on your drive to its most efficient state. This will group all the free space on the drive in one spot where Linux will be able to best use it.

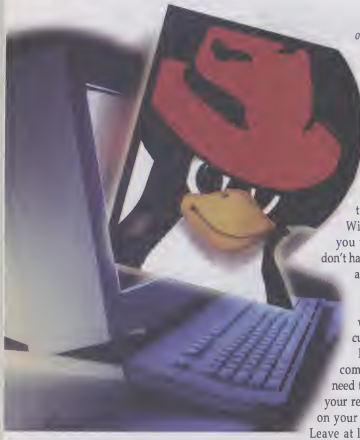
9 Start the installation.

With everything in order, it's time to get down to business. One of the advantages of buying a commercial Linux package such as Red Hat is that the installation program seems more familiar than the standard, lean Linux routine. As with Windows, wizardlike dialogs guide you through much of the process, leaving little for you to do but read the on-screen instructions carefully and choose the correct options. Before long, you'll be the one people call for computer geek advice. GS

by Alan Phelps

Installing Red Hat Linux 7.0

Take These Steps To A New OS



A tricky installation has been one of the well-publicized drawbacks of using the Linux OS (operating system) on desktop computers. The Red Hat 7.0 version of Linux, however, is fairly easy to install, but depending on your installation choices, you may still run into a few snags. We'll try to help you through the process.

We installed Red Hat Linux 7.0 (the boxed CD-ROM version) on both an IBM Aptiva PC with a Pentium III processor and a CTX computer with an AMD-K6-2 processor. We chose the workstation-class installation, which requires at least 900MB of free hard drive space, and we chose to protect our current Windows installation by partitioning our hard drive so we could run both Windows and Linux. Read more about hard drive partitioning in the "Creating Hard Drive Partitions" sidebar. (*NOTE: Many of the tips and steps described in this article will work for other types of installations, too, but if you choose another type of installation, you'll want to closely follow the instructions included with Red Hat Linux 7.0.*)

■ **Preparatory Steps.** You'll first need to decide whether you want to run Linux alone or whether you want to run Linux in combination with another OS, such as Windows 95 or Windows 98. If you want to run Linux alone, you don't have to concern yourself with creating partitions; the Red Hat installation program will create them for you. (But this process will erase all the information currently on your hard drive.)

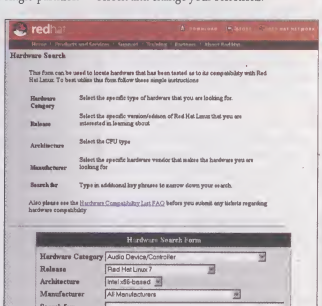
If you want to run Linux in combination with Win98, you'll need to place your Windows OS and your related files in a single partition on your hard drive. Leave at least 900MB of free space outside of the main Windows partition; this is where Linux will be created. If possible, we'd recommend saving 1.5GB to 2GB of free space outside of the Windows partition to use for Linux. This will give you plenty of room to use and expand the OS.

Finally, you should also read the "Installation Tips" sidebar with this article for a few other preliminary steps you might need to take. You may also want to read the "Troubleshooting Installation Problems" sidebar for information on problems you may encounter during the Red Hat Linux 7.0 installation.

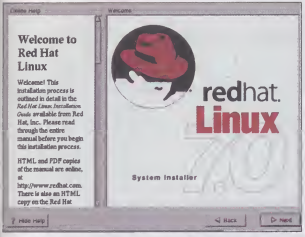
■ **Getting Started.** Once you're ready to install Linux, insert the CD 1 Binary CD in your CD-ROM drive and reboot your computer. If your PC can boot from the CD-ROM drive, you'll see a Welcome To Red Hat Linux 7.0 message on your screen. If not, you'll need to boot the system using the Boot Diskette included with the Red Hat Linux 7.0 box.

At the Welcome screen, press the ENTER key to begin the installation process using the graphical installation program. You'll then see a series of text strings scrolling on your screen as the installation program begins tracking your hardware and loading the necessary installation files. After approximately 30 to 120 seconds, you should see the Red Hat logo before moving on to the graphical installation program.

As part of the graphical installation program, you'll be making your selections concerning installation in the right half of the screen. In the left half, you'll see an Online Help feature where you can read about the selections you make on the right half of the screen. If you don't want to view Online Help, simply click the Hide Help button. (Click Show Help to make Online Help visible again.) After making your selections on each screen, click the Next button to move to the next step in the installation program. Click the Back button to return to a previous screen and change your selections.


redhat
Hardware Search
This form can be used to locate hardware that has been tested or to do compatibility with Red Hat Linux. To best utilize this form follow these simple instructions:
Hardware Category
Select the specific type of hardware that you are looking for.
Release
Select the specific version/release of Red Hat Linux that you are interested in learning about
Architecture
Select the CPU type
Manufacturer
Select the specific hardware vendor that makes the hardware you are looking for
Search for
Type in additional key phrases to narrow down your search.
Also please see the Hardware Compatibility List FAQ before you submit any tickets regarding hardware compatibility
Hardware Search Form
Hardware Category
Audio Device/Controller
Release
Red Hat Linux 7
Architecture
Intel x86-based
Manufacturer
All Manufacturers
Search for:

Check out Red Hat's Hardware Search page to find hardware that's compatible with Red Hat Linux 7.0.


Online Help
Welcome
Welcome to Red Hat Linux
Welcome! This installation process is outlined in detail in the Red Hat Linux Installation Guide available from Red Hat, Inc. Please read through the entire manual before you begin the installation process.
HTML and PDF copies of the manual are online, at http://www.redhat.com. There is also an HTML copy on the Red Hat
redhat.
Linux
System Installer
Hide Help
Back
Next

In a graphical installation, you'll see the Welcome to Red Hat Linux screen that signifies the start of your installation.

One note on the graphical installation program: Linux's checkboxes don't use the check mark method of activation that Windows-based programs do. Instead, you know Linux's checkboxes are active when they appear to be indented into the screen, and they are inactive when they appear to extend out from the screen, like a button. This difference can be a little confusing, so make sure you have correctly marked all the checkboxes before you click Next.

Finally, remember that the installation program won't permanently activate the selections you make on the first dozen or so screens until you're near the end of the installation process. You can abort the installation process and remove all selections you made by pressing CTRL-ALT-DELETE at any time prior to clicking Next at the About To Install screen.

The Installation Steps. Here are the various screens you'll most likely encounter as you perform the Red Hat Linux 7.0 installation. (Depending on your hardware configuration and installation choices, you may see some different screens.)

Language selection. Click the language you want to use with Linux.

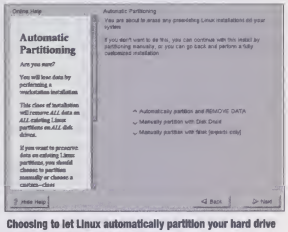
Keyboard configuration. The installation program will try to choose the keyboard model and layout currently installed on your system. Either accept the current choices or click your keyboard's entry in the list. You can test your keyboard in the Test Your Selection Here text box.

Mouse configuration. Select your system's mouse from the list. Click the Emulate 3 Buttons checkbox if you want your two-button mouse to behave like a three-button mouse. (You can accomplish this by simultaneously pressing the left and right buttons.) We recommend a three-button mouse for Linux.

Welcome to Red Hat Linux. The online help documentation found here contains additional information on installation

Install options. Choose the type of installation you want. If you choose Upgrade, your older version of Red Hat Linux will be overwritten along with any other Linux program and data files you had. Because we were new to Linux, we chose the Workstation installation, which is a full installation.

Automatic partitioning. Using automatic partitioning is the fastest and easiest way to create the necessary partitions to run Linux. This option should be available to you if you're reformatting your entire hard drive or if you're installing Linux in free space outside of your Win98 partition. (If you don't have enough free hard drive space for the installation, you won't see this window, and you'll have to use manual partitioning.) If you click Automatically Partition and then


Online Help
Automatic Partitioning
Automatic Partitioning
Are you sure?
You will lose data by performing a workstation installation.
This class of installation will remove ALL data on ALL existing Linux partitions on ALL disk drives.
If you want to preserve data on existing Linux partitions, you should choose to partition manually or choose a custom--class
You are about to erase any preexisting Linux installations on your system
If you don't want to do this, you can continue with this install by partitioning manually, or you can go back and perform a fully customized installation.
Automatically partition and REMOVE DATA
Manually partition with Disk Druid
Manually partition with fdisk [expects cisb]
Hide Help
Back
Next

Choosing to let Linux automatically partition your hard drive is much easier than doing it manually.

Installation Tips

Take our advice; it'll make installation easier.

Consult The Configuration. Printed inside the Red Hat installation guide is a checklist for writing details about your computer's hardware configuration. By writing down this information beforehand, you may save yourself many hardware headaches during installation. If you're using Windows 95 or 98, you can obtain some of this information by double-clicking the System icon in the Control Panel.

Use The CD. We recommend that those installing Red Hat Linux for the first time use the Red Hat 7.0 CD box set, rather than try to download the installation program from the Red Hat Web site. The additional documentation that comes with the box set should help answer most of your installation questions.

Better Safe Than Sorry. Make a backup of your system, unless you don't care if all of the data on your hard drive is erased during the installation process and the creation of partitions.

Install Windows First. If you want to install and run a Windows OS (operating system) with Linux, we recommend that you install the Windows OS before installing Red Hat Linux because trying to install Windows after installing Red Hat Linux will usually result in major problems.

Think Positive. Our final tip comes directly from Linus Torvalds, the creator of Linux. He says installing Linux doesn't necessarily require any special computing knowledge, but it does require a positive frame of mind and a willingness to experiment.

"It's not so much what you have to learn before (using Linux), but more of a readiness to learn at all," Torvalds says. "People who want to learn tend to have no trouble at all. . . . Of course, if you know what to expect, and you know what Unix is, that will make the learning curve less. Perusing books and magazines about Linux can help, no question about it. But on the whole, that's going to be secondary." □

This About To Install window is your last chance to abort installation before the installation program makes changes to your hard drive.

Next, the installation program will create the necessary partitions later.

If you haven't created a partition to hold the data and program files currently on your hard drive, including your Win98 OS, and you don't have free space available outside that partition to install Linux, choosing to automatically partition will reformat your hard drive and erase all data. Be sure you've done the proper preliminary work, including making a full backup of your hard drive, before running the installation program and making a selection here.

Manual partitioning. You can choose to manually partition your hard drive by clicking the appropriate checkbox on the Manual Partitioning screen, but it is a far more difficult task than many users will have the expertise to handle. The two choices you have on this screen are Manually partition with Disk Druid and Manually Partition with fdisk [experts only]. Both methods can be difficult to use unless you're extremely familiar with partitioning. Note that any partitioning comes with a high risk of data loss.

If you decide to use manual partitioning, be sure your Boot partition is a maximum of 16MB in size and your Swap partition is at least 16MB in size. Your Root partition will need to be a minimum of 900MB, although we'd recommend closer to 2GB. See the Red Hat Linux 7.0 Documentation CD (CD 3) for more information on manual partitioning.

Network configuration. If you have a network card in your computer, you'll need to provide some information about it here.

Time zone. Select your time zone from the list in the right half of the window.

Account configuration. At the top of this window, you'll need to create a root password for the system. The root password will let you make universal changes to the system for all users.

Troubleshooting Installation Problems

Keep these tips handy so you can quickly solve any problems you encounter.

Hardware Hassles. Incompatibilities with hardware setups are probably the most common installation problems users will face because some hardware hasn't been tested to work with Red Hat 7.0. Discover potential problems before installation or solve hardware incompatibilities during installation by checking with your hardware's manufacturer or visiting http://hardware.redhat.com/redhatready/cgi-bin/us/db-hcl.cgi to see the list of compatible hardware.

No Mouse. If your mouse won't work with the graphical installation program, you have two choices. You can try to use your keyboard to make the selections on the graphical installation screens, using TAB and the arrow keys to move forward and back within a list and between buttons. Alternatively, you can restart the installation program and select the text version of the program by typing **text** when you see the boot: message on the Welcome To Red Hat 7.0 screen.

Can't Detect IDE CD-ROM. Red Hat Linux's installation program sometimes has problems detecting IDE (Integrated Drive Electronics) CD-ROM drives. If you can't make the program find your CD-ROM drive, you will need to create a DOS partition of about 650MB. Create a Redhat directory in the partition and copy the data from the Red Hat Linux CD-ROM to the Redhat directory. Then start the installation program from the Redhat directory.

Display Problems. While running the installation program, you may encounter problems with your display, including having the borders of the program's window extend beyond the size of the monitor. Another potential problem involves text and graphics bleeding into the wrong areas of the display, making some areas unreadable. This problem is usually magnified when you use the scroll bars and arrow buttons to read through a list of text. We had some success restoring the display to its proper readability by clicking the Hide Help button followed immediately by the Show Help button. You also may want to use your keyboard's arrow keys, rather than the scroll bar buttons, to move through the text lists.

These are especially annoying problems, but they don't seem to actually affect the installation itself. If you experience such display problems, be sure to keep the printed installation guide handy to help decipher unreadable text on the screen. You could also choose to use the text version of the installation program, rather than the graphical version, as described in the No Mouse section above.

Notebook Woes. Because of the unique hardware configurations that engineering a notebook computer sometimes requires, it's impossible for Red Hat Linux to account for every combination. Therefore, it's tough to ensure hardware compatibility with every notebook computer. For detailed information on configuring Linux for a notebook computer, visit http://www.cs.utexas.edu/users/kharker/linux-laptop.

Giving Red Hat Linux A Voice. Problems with audio are common with Linux because most sound cards use plug-and-play technology, which works under Windows but not under Linux. Chances are you'll need to disable the card's plug-and-play capabilities before it will work under Linux.

Fix Any Bugs. The Red Hat Web site (http://www.redhat.com/support/errata) publishes downloadable fixes for bugs in its software. If you receive signal 11 or signal 7 errors, it could signal an installation error that is fixable with a bug update.

Booting Problems. If you use a third-party partitioning and operating system management software package, you may have problems when trying to boot Linux. You may need to bypass the third-party management software by using the Linux boot diskette you created during installation. □

Creating Hard Drive Partitions

As a requirement for installing Red Hat Linux 7.0, you'll need to create partitions on your hard drive. We won't try to sugarcoat this: Creating partitions can be a dangerous process, especially if you want to keep the data on your hard drive intact.

When you create partitions on a hard drive, you are basically splitting the storage capacity of your hard drive into two or more segments. Each of these segments will be assigned a unique drive letter.

Why Partition? Partitions are handy for several reasons. The space on the hard drive, especially for a very large hard drive, will be used more efficiently when partitions are in place. Partitions also let you load more than one operating system on your computer (depending on the operating systems). However, because of the way partitions are created, your hard drive may need to be formatted entirely before the partitions can be created. Formatting a hard drive means erasing all data stored on the drive.

Get Some Help. If you want to save the data on your hard drive, keep your current Windows setup, and run multiple operating systems, you'll probably want to turn to a third-party hard drive management software package to reorganize your hard drive and create partitions. PartitionMagic from PowerQuest (http://www.powerquest.com) and System Commander from V Communications (http://www.v-com.com) are especially good for creating partitions and running multiple operating systems. Either software package costs between $50 and $75.

Don't Forget To Back Up. Even if you're using a third-party software program to help you create partitions, you must make a backup copy of your hard drive. Any time you create partitions, even with partitioning software, you run the risk of losing some or all of your data. You may not immediately notice some data loss or corruption because of partitioning, either, which means it's important to keep the original backup data for several weeks.

You'll also need plenty of free space on your hard drive before attempting to create partitions. The third-party partitioning software will push all of your data to one partition and create new partitions out of the remaining space. Follow the directions provided with the partitioning software carefully.

If you don't care about saving the data on your hard drive, the Red Hat installation program can format your hard drive and create the needed partitions for you. □

In the lower portion of this window, create a user account for yourself and click Add. You'll use this to log into Linux most of the time. You can enter additional users at this time or do it later.

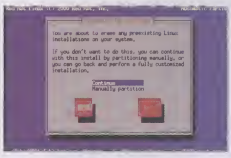
Selecting package group. On this screen, you can choose the graphical user interface in which you'd like to operate (either GNOME or KDE; both packages are very similar), as well as whether to install the games package. Read "Getting Around In Linux: A Look At Two Graphical User Interfaces" on page 80 of this issue for more information on these two user interfaces.

X configuration. The installation program will now set your monitor and video card. After making the selections, click Test This Configuration. You should see a dialog box asking whether you can read a message. Click Yes to save the X configuration settings. If you don't see the message after 15 seconds, you'll need to try other settings.

■ **Finishing Up.** Once you've reached the About To Install window, the installation program is ready to install the Linux software. This is your last chance to abort installation by pressing CTRL-ALT-DELETE. To move ahead, click Next.

You should see the Preparing To Install dialog box before moving to the Installing Packages screen. The installation program will keep you updated on its file-copying progress in the upper right area of this screen.

Once all of the installation files have been copied and the partitions have been created (usually a 15- to 30-minute process), you'll see


You are about to create any pre-existing Linux installations on your system.
If you don't want to do this, you can continue with this install by partitioning manually, or you can go back and perform a fully customized installation.
Continue
Manually partition

If you can't run the graphical installation program, you'll need to use the text-based installation program, shown here.

the Boot Drive Creation screen. Insert a blank diskette and click Next. You can use this diskette to boot your PC into Linux in case of a problem with the booting process from your hard drive, which can be fairly common if you're using a dual-boot system.

Once you make the boot diskette, you'll see the Congratulations screen. You've successfully completed installation! Remove the boot diskette and the installation CD from their drives and click Exit to reboot your computer.

The first time you run Linux, it may notify you of some hardware conflicts. Make selections from the choices provided to match your hardware configuration. (Read the "Troubleshooting Installation Problems" and "Installation Tips" sidebars for more information on hardware conflicts.) Then Linux will ask you to log in. Type the username and password you created during the installation process. (Remember that both are case sensitive.)

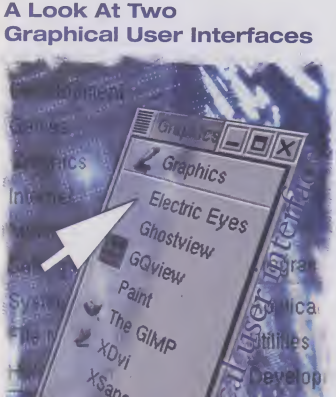
■ **Firsthand Experience.** While the installation we performed was fairly straightforward, we did encounter a few problems. The display text's tendency to bleed and become unreadable when using the graphical installation program was especially annoying. Creating the necessary partition structure was more than a bit nerve-wracking, too. If you want to keep any of your current data or run a dual-boot system, we'd strongly recommend using a third-party partitioning software package.

Installing Red Hat Linux 7.0 will be tough for anyone who doesn't have a fair amount of computer knowledge and who isn't willing to learn some new techniques. As with most things in life, though, the more preparation you do, the happier you'll be with the results. In the case of installing Linux, the preliminary work, including reading through and understanding all of the manuals and making a full backup of your hard drive, is the unquestioned key to success. GS

by Kyle Schurman

Getting Around In Linux

A Look At Two Graphical User Interfaces



The open and extendible operating system Linux is quickly reaching the point where it has incorporated the best of both worlds: the stability and usability of a Unix system and the look and feel of more traditional operating systems such as Mac OS or Windows. It is this look and feel, the GUI (graphical user interface), or desktop environment, which is making Linux more attractive to desktop computer users. Most of the Linux distributions ship with one or more GUIs.

Take Red Hat 7.0, for example. The latest version of Linux from the industry-leading seller Red Hat ships with two very powerful environments: the original Red Hat favorite, GNOME (GNU Network Object Model Environment), and KDE (K Desktop Environment), which has been bundled with Red Hat as a GUI option since Red Hat version 6.0. Both environments are quite similar to each other in their use of icons, menus, windows, and other graphical features that should be very familiar to users of such operating systems as Windows. Both GNOME and KDE make it easier to open and work with applications, perform tasks, and navigate around the screen, and both have a very high level of customization; so you can set them up to look and feel the way you want.

While the two differ a bit in the way that they work (and look), the most striking thing users will notice is the amount of overlap between them. Both are based very strongly on graphical elements that have been widely used by more conventional operating systems (such as the Mac OS or Windows systems) for years. The best way to decide which environment is right for you is to install them both and put them through their paces.

■ **Installation Choices.** You'll need to consider the amount of free disk space you have (you'll need about 1.7GB for both GNOME and KDE) if you want to install both GUIs. During the Red Hat 7.0 installation, you will have the option of Selecting Package Groups (look for this right after the Time Zone Configuration and Account Configuration sections in the installation process). To select both GNOME and KDE, make sure that both options are checked, and the installer will put them both on your system. Each time you log on to Linux, you'll have the choice of which environment you wish to use for that session. For example, at the GUI Login screen, click the Session menu in the upper-left corner and select GNOME or KDE). You can easily switch between the two by logging out and logging back in under the new environment, or you can try bits and pieces of each from within the other environment. For example, GNOME makes it possible to access KDE items from its Main Menu.

■ **GNOME.** GNOME is a highly configurable, graphics-driven environment. With GNOME, you can easily configure your desktop to look and work the way you want it to. A session manager keeps track of all your settings and currently running applications so that once you get it set up the way you want it, it stays that way.

The GNOME environment offers several specialized features that help you work more effectively with Linux. Here are a few of them.

The GNOME Panel. The GNOME Panel resides (by default) along the bottom edge of the screen. From the GNOME Panel, you can access menus, application launchers (shortcuts to applications such as Netscape Navigator), applets (tiny programs such as a clock, system monitors, or a CD player), and more. Like everything else about GNOME, the GNOME Panel is highly configurable.

You can easily do such things as move icons and add and remove items from the Panel by right-clicking the Panel or objects on it. Items such as drawers, which are pop-up menus that can hold launchers, applets, and other drawers (basically anything a Panel can hold) can be added, as can just about anything else that you want easy access to.

You can create multiple Panels that rest either vertically or horizontally and set them up so they float on the desktop, stretch along an entire edge, or are aligned with an edge but don't take up the whole edge. You can also set the Panels to hide automatically, or you can click either edge of a Panel to collapse (hide) it. The GNOME Panel is also capable of holding the Pager, a section that holds all open tasks or

Click the perforation (the dotted lines we've circled above) on a menu or submenu you use frequently, and GNOME will place that menu on your desktop so you can access it easily.

applications, and the Desk Guide, a control area that lets you easily manage and switch between multiple virtual desktops. Think of the GNOME Panel as the Taskbar in Windows.

Main Menu. At the far left of the GNOME Panel, you'll see a little foot icon. This launches the Main Menu, which gives you access to applications, configuration tools, a command line prompt, and more. If you have more than one Panel, you can have more than one Main Menu, each of which can have its own configurations. A Global Menu, which you can access by right-clicking any blank space on the GNOME Panel, provides the same commands as the Main Menu.

Open the Main Menu by clicking the foot icon and then drilling down through the various pop-up menus until you reach what you're looking for. To configure the Main Menu, right-click the foot. For extra convenience, GNOME provides a perforation feature that lets you "tear off" a menu and place it on the desktop. This comes in handy when you frequently use a menu that is nested deep in the Main Menu. To "tear off" a menu, click the perforation (dotted lines) at the top of the menu you want. Microsoft users can compare the GNOME's Main Menu feature to the Start button in Windows.

Desktop. The desktop in GNOME works like the Windows or Mac desktop. Place items such as files or application launchers (icons) on it and double-click them to open them. While clicking launchers will open the specific application they're associated with, clicking folders will open the file manager, which lets you work with that folder doing such tasks as renaming and deleting items. GNOME lets you open two or more file managers at a time, so you can easily drag and drop items between them.

Like Windows and the Mac OS, the desktop background is highly customizable; you can change the background color, use tiled or regular images, and more.

GNOME windows. Most computer users will easily recognize GNOME windows, which feature menus on the top left and buttons to minimize, maximize, and close the window on the top right. With GNOME, you can easily lock the screen so other users can't use or view your GNOME session without a password. To do so, right-click either end of the GNOME Panel and select Lock Screen or placé a Lock Screen button on the Panel itself for easy access.

Mouse tasks. GNOME also uses the Unix convention of three-button mousing. If your mouse doesn't have a third button to use for pasting text and moving things, you can set the option during installation to press both buttons at once to simulate the third.

■ **KDE.** As we mentioned earlier, KDE works and feels a lot like GNOME, and many times the only apparent difference is in what KDE chooses to call things. In KDE, for example, the GNOME Panel becomes the Kpanel, the Application Starter takes the place of the Main Menu, the big K icon at the far right of the Kpanel takes the place of the similarly placed GNOME foot icon, application launchers become Nicknames, and the Task Bar takes the place of the Pager.

Customization made easy. Also, like GNOME, KDE is highly configurable and it provides right-click context menus for the desktop, panels, and icons. Mouse-over tool tips (the text that appears then you hold your pointer over certain objects) give brief explanations for nearly every item that makes up KDE. In addition, KDE offers very comprehensive help sections, which you can easily access through a panel icon.

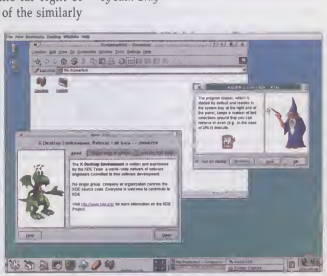
Make it stick. One of the great features associated with KDE's virtual desktops is a little "pin" that appears on window Title bars. By clicking the pin, you can make a given window "sticky," meaning that it shows up on all virtual desktops. This is a handy way to keep something that you use often, such as a calendar, within easy reach on any desktop you're using.

■ **If It's Not Perfect, Fix It.** Something to keep in mind is that Linux is an open source project, which means both of these environments have been built and are constantly being modified by the communities of people who use them. If you don't find exactly what you want in these environments, get involved with the modification process to make them fit your situation better.

Both the GNOME Web site (http://www.gnome.org) and the KDE Web site (http://www.kde.org) offer news, tips, software, developer/development resources, and a wide range of other information pertinent to their GUI. Whether your talent is writing, graphics, or programming, if you want to help these environments evolve, you'll be welcome. With something like Linux, selecting a community you're comfortable with can be as important as being comfortable with the GUI itself.

And unlike the Windows or Mac desktop environments, a Linux GUI is something you can actually leave your mark on. GS

by Rich Gray



KDE's helpful KTip program makes it easy for new users to familiarize themselves with the KDE environment.

Customize Your Linux Desktop

The Terminal Window & Graphical Interface Offer All The Power You Need

You now have a brand-new Red Hat Linux 7 installation, but it lacks a little of your own style and flair, so you want to customize it to your taste. After all, as an open source operating system, Linux gives you the flexibility to do so, and it's fairly easy to do. First, we will briefly explore how to configure and start the graphical mode and then we will detail some basic actions you should do while logged in. We also will cover some security issues, as well as some cosmetic issues.

■ **Getting Started.** Let's begin with some basic concepts about your graphical desktop. When you install Red Hat Linux, the installation program will ask you if you want the graphical desktop to be started by default. It is a good idea to select yes if the X Window installation process went smoothly for you. This way, when you start up your computer, it will go straight into graphic mode. If you have not selected the graphic mode to start by default, you will see a text prompt. In both cases, you will need to enter your login name and password to be able to use the computer. The login you should enter for system administration tasks is root. If you are in text mode, simply type **startx** to go in graphic mode.

The default view you get when you are in graphic mode is the one provided by GNOME, which is the free desktop environment provided by the GNU Project. The first thing you want to do is figure out how to get around your desktop and how to start a terminal window. It is from a terminal window that you will be able to start programs, execute commands, and do administrative tasks.

On the bottom of the screen is the Panel Bar, which contains icons for the most used items. You'll also find a pager that you can use to switch between applications and the GNOME menu where other applications are listed. You can start a terminal window by clicking the icon that looks like a monitor or by selecting it from the GNOME menu.

For the few times you'll have to use a terminal window, there are a few basic commands you should know. Here is a short list you can use:

- **ls**—This command will list the files in the current directory, so use it to see which files are on the system. You can add the -l flag to see details about each file, including its permissions, size, and owner.
- **pwd**—This will tell you which directory you are in. The directory tree begins at root (/) and goes on to the various subdirectories. You also should note that your home directory is referenced as "~."
- **cd**—This Linux command works just like the DOS Change Directory command. If you are at the root (/) directory and you want to go in the usr directory (/usr), you simply type **cd usr**.
- **cp**—This command will copy a file to another location. For example, if you want to copy the file "document.doc" from your home directory to the root directory, you would type **cp ~/document.doc /**.

■ **Management Options.** You don't have to learn all of the console commands because most of the things you will do with your Linux system can now be done with graphical programs, as we will soon see.

One thing you should learn how to do is to manage users. It is very important for you to learn how to properly add users, create secure directories for them, and change their passwords. To change a password, you can use the passwd command in a terminal window and add the name of the user you want to change the password of. Or, you can simply use the command with no argument to change your own password. To add a user, you can use the adduser command.

If you are using more than one operating system, you may want to set up a dual-boot. By default, your Red Hat Linux installation puts LILO, which is the Linux Loader, on the first **sector** (a division of a storage medium, such as a hard drive or diskette; diskettes or hard drive platters are divided into wedge-shaped sections that segment the circular tracks into small arcs) of your hard drive. You can change this configuration by editing the file /etc/lilo.conf. This file lists the operating systems that can be loaded at bootup, and the order in which they are listed determines which one the computer loads by default. A full list of commands for that file is available in the manual page for lilo.conf, which you can access by typing **man lilo.conf**.

Security. One thing that is very important in early system customization is security, concerning both local users and remote users. You should make sure your system doesn't have open ports that it doesn't need, and you shouldn't be running any programs that may have security holes in them.

To check the open ports on your system, open your favorite text editor or the default text editor that is available in the GNOME menu and then open the file /etc/inetd.conf. This file lists the services that your computer

provides to the rest of the world. By default, several services will be offered including FTP (File Transfer Protocol), Ident, and Telnet. If you don't intend to let anyone log on your computer or fetch files from it, you should disable these services. You can disable any service by adding a comment (the pound sign [#]) in front of a line in that file.

You also should make sure you are not running any programs that you don't need. Each program that runs on your system may be a security risk, and it uses system resources that may be slowing down your system. To see which programs are started at boot-up, run the ntsysv command. You can enable and disable programs from there.

Manage files. You also should learn how to use Linux's File Manager. This is very similar to the Microsoft Windows or MacOS file managers, so it should already be familiar to you. From the file manager window you can do most operations that deal with files, including changing permissions, copying, moving, renaming, and deleting them. Be careful when you run the File Manager in root mode because if you make a mistake and, for example, delete the passwords file, you may be in trouble.

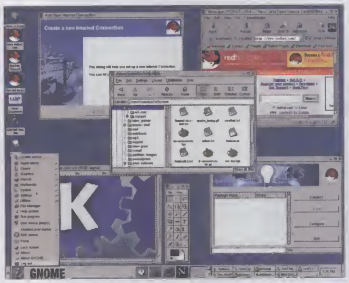
■ **Look & Feel.** Now that system security and file management are handled, you should try to make your system feel at home. In the GNOME menu, there are several small applications that can help you configure your desktop, but the Control Panel is the main one. Here, you can change some settings for how the keyboard and mouse will behave, what kind of look and feel you want your desktop to have, and if you want sounds associated with events. These are all features related to the X Window environment.

GNOME is the default window manager that comes with your Red Hat Linux distribution. It contains a window manager that handles programs' windows, a file manager, a control panel, and other utilities. However, there are other choices. For example, there is another desktop environment called KDE, which is very similar and has similar capacities. The main difference between the two is their external look. You can switch from one to the other using the Desktop Switcher, which is also located in the main menu.

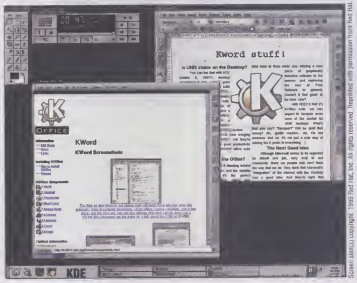
System configuration. In past versions, system configuration was only accessible from the command line or a terminal window. Although this is still possible, a beginning Linux user can now expect to do most functions from the graphical interface. We'll take a look at a few programs you should try out.

The main menu is divided into several sections, including ones for system administration and utility programs, games, Internet applications, and more. You can customize that menu by using the menu editor, which you can access from the menu itself.

As you can see, you can use many applications along with terminal commands to complete system-configuration tasks. Thankfully, a group of developers created a program that takes all the aspects of configuration and puts it in a single application called LinuxConf. You also can start this program from the main menu of by typing **linuxconf** in a terminal window. So, rather than using all the separate Red Hat utilities, the various text based commands, and using a text editor to manually edit configuration files, most of what you need to configure can now be done with the LinuxConf utility.



Red Hat Linux 7 comes preloaded with two graphical interfaces to help Windows users get acquainted, GNOME (above) and KDE (below).



Screen shots(c) copyright 1998 Red Hat, Inc. All rights reserved. Reprinted with permission from Red Hat, Inc.

LinuxConf has become the most popular configuration tool in Red Hat Linux because you can use it to make changes for the entire Linux system. When you launch LinuxConf, you will see a left tree pane that has a list of items you can configure. From there, you can configure your networking options, Web server, FTP server, user accounts, file systems, quotas, e-mail policies, routing, and much more. You should take a few minutes to explore this application because this is the best and most powerful way to configure your system.

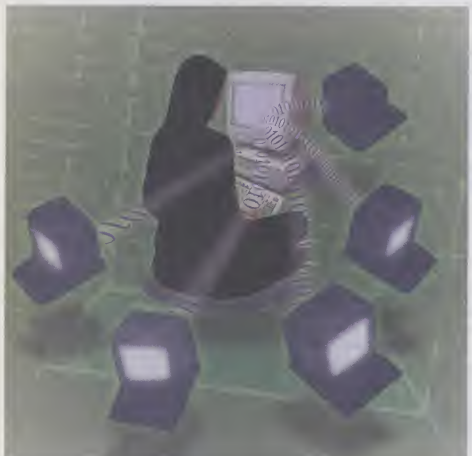
Basic things you should check in LinuxConf is the host name listed in the Networking section and the User Accounts section, which you can use to add new accounts or delete accounts that you no longer need. You also can check the file systems that are automatically mounted in the File Systems section. In addition, if you have a Windows partition that you want to access from Linux, you can configure it here, too.

By using both the terminal commands and the graphical interface, you can modify a lot of parameters and make your system safer and more comfortable. Take advantage of both to make your Linux system truly yours. GS

by Patrick Lambert

The Linux Network

Sharing A Dial-Up Connection To The Internet



Like its Unix brothers, Linux was always meant to be a networking operating system. Back when MS-DOS and Windows wished they could talk to other computers, Linux was well on its way to becoming one of the most installed network operating platforms. Built into the Linux kernel are file and printer sharing and Web and FTP (File Transfer Protocol) hosting. Linux's open source nature makes it easy to configure and tweak to fit your exact networking needs.

Getting Started. There are a couple of ways to connect a network to the Internet. We are going to use a dial-up modem and a PC running Linux to connect to an ISP (Internet service provider). We will also show you how to protect your network from unwanted Internet activity.

Rather than detail the steps for connecting your network down to the command line (this would be difficult because each distribution of Linux, or version of the kernel, handles internal and external commands and utilities slightly differently), we'll present an ordered progression of steps you will need to get your network connected and running.

We are using Red Hat Linux, 7.0, (kernel version 2.2.16). A 3Com Ethernet adapter provides our LAN (local-area network) connection. Our Linux box is a 120MHz Pentium processor with 64MB of RAM. For our dial-up connection, we are using an external U.S. Robotics 56Kbps modem.

Make sure that you have already correctly installed Linux and an Ethernet adapter and that your network is up and running. Try pinging (sending a request to an IP address and waiting for a reply) another PC on your network. For example, if you have a Windows 98 PC on your network with the IP address of 192.168.0.2, open a terminal session (click the Terminal icon on the applet panel) and type **ping 192.168.0.2**. You should get responses from that PC until you press CTRL-C. If you don't get a response, try pinging 127.0.0.1 (localhost). If you still fail to get a response, check your Ethernet configuration files.

Setting Up A Dial-Up Connection. Connecting a network to the Internet with a dial-up modem is no different than connecting a single computer to the Internet with a dial-up modem. The advantage of a network connection is that you can use a single phone line to connect more than one computer to the Internet, which saves you time and money. When you share a connection as we are going to describe, you are routing TCP/IP (Transmission Control Protocol/Internet Protocol) packets from one network interface (such as a network adapter card or modem) to the other. We're using a PPP (Point-To-Point Protocol) dial-up connection.

PPP is the Internet standard for sending information packets over the Internet. Setting up a PPP dial-up connection is pretty easy with Linux because you can use the graphical tools found in Red Hat 7.0 to do all of the hard work for you. Start the Red Hat Dial Internet Configuration Wizard by clicking Programs, Internet, Dialup Configuration. This wizard will walk you through setting up a PPP connection to your ISP as well as installing a modem if you don't have one installed.

Once the wizard establishes that your modem is properly installed, it will ask you to name the connection you are creating and enter the phone number to dial to make the connection. Only enter the area code and long distance prefix if you need to call out of your local dialing area to get to your ISP. The next window asks you to enter your user name and password for the ISP. Do so and click Next. You will now see a screen that has two items listed: Normal ISP and AT&T Global Internet Services. Unless you are an AT&T customer, choose Normal ISP and click Next to finish the wizard.

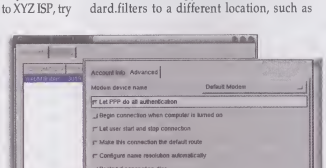
The Internet Connections window displays the account name you just created and its current status. Highlight the account and click the Edit button. Click the Advanced tab and click Let PPP Do All Authentication so the dialer will remember your username and password and supply that information automatically

when connecting. Click Apply, then OK to get back to the Internet Connections window.

Test Your Connection. Before you move on, you should check your PPP dial-up connection to make sure it works as expected. An easy way to do this is to use the RHNM (Red Hat Network Monitor). RHNM will manually bring up the PPP interface (your modem) and connect to the Internet. Later on, we will show you how to use another program to automatically dial the connection.

To start RHNM, click Programs, Internet, RH Network Monitor. You will see a small window made up of three sections. The top one is your PPP interface (your modem), the middle one is the Ethernet card, and the bottom one is the loopback interface. (TCP/IP uses this for local communication.) To manually start your PPP connection, click the dim green button to the right of the PPS connection.

Once connected, you will see either little lights blink or a scrolling graph showing send and receive traffic (this depends on the version of usernet you have). This lets you know that you are sending and receiving data from your ISP. Next, open another terminal session and try to ping an address outside of your Linux box. For instance, if you connect to XYZ ISP, try to ping www.xyz.com. This will check both your DNS (domain name server) information and your basic connectivity. If you were not successful in connecting to your ISP, go to the /var/log/messages file to see what happened during the attempt. This log file can provide you with some insight into what went wrong. If you still need help, check out http://www.interweft.com.au/other/ppp-faq/PPP-FAQ.html, a helpful Linux PPP FAQ.



Make sure you click the Let PPP Do All Authentication option in the Advanced tab of the Internet Connections window so the dialer will remember your username and password.

Automating the Connection. Diald is a handy utility that you can use to automatically connect your Linux network to your ISP. Diald gives the impression that you have an "always on" connection to the Internet by monitoring information packet activity and automatically establishing a connection whenever a request is made for data outside of your local network. Diald will automatically disconnect from the Internet when there has been no traffic over the modem for a specified amount of time. If the connection to your ISP is broken for some reason, diald will automatically try to reconnect you to the Internet.

Diald did not come with our Red Hat 7.0 distribution, so we downloaded it from the official diald home page at http://diald.sourceforge.net. The only system requirement for diald is that the kernel be compiled with SLIP (Serial Line IP) enabled. Diald uses SLIP to monitor the network traffic on the network interfaces, in our case Ethernet and PPP. If the network requests something from a nonlocal resource, such as a Web site, it dials the modem to your ISP.

Installing diald is as easy as downloading the source code, unpacking it, and performing a *make* depend. Next, you perform a *make* and then a *make install* logged in as root user. Make, short for Makefile, is a script that compiles or builds the binaries, or executable portions, of a software application. For more information on Make, please check out the chapter on using Make at http://www.linuxdoc.org/HOWTO/Software-Building-HOWTO-3.html.

Tweaking Diald. Once you have installed diald, you will want to check a couple of files to make sure they meet your needs. To start, copy the file /usr/lib/standard.filters to a different location, such as /etc/diald.conf, because some people have reported possible problems when the standard.filters file is in its default location. Moving the file to /etc should keep things going. /etc is the original location of the config file from an earlier version of diald.

/etc/diald.conf contains a list of network services found in /etc/services and a value that tells diald how many seconds of up time each service gets. This means that after so many seconds of idle time, the modem will hang up. It will not disconnect you while you are actually working, only when there is no traffic over the modem. This file is easy to read, and the man (manual) pages document it well.

The second file to check out is the script to start diald. We suggest starting it from rc.local by adding the line /etc/rc.d/rd.diald to the end of the /etc/rc.d/rc/local file. This lets you run it also as a standalone program if you need to. There is one other file that comes with diald, /usr/lib/diald/diald.defs, that has a list of internal filter rules in it. Normally, you will not need to make any changes to this file. If you find you do need to, please refer to the man pages on the proper format of this file.

Here are the contents of a sample /etc/rc.d/rc.diald file:

```
echo -n "Starting auto-dialer: "
/usr/sbin/diald /dev/modem accounting-log
"/var/log/diald" -m ppp
defaultroute modem \ crtscts local
123.456.789.012 remote 0.0.0.0
connect "/usr/sbin/chat -f /etc/ppp/ppp-
chatfile"\ fifo "/etc/
  diald.fifo"
    echo "diald"
```

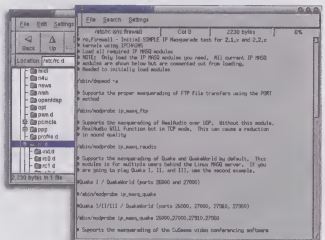
You will want to change at least one item in this file to fit your situation. If your ISP has assigned you a fixed or static IP address, you will need to substitute that address for the local IP address, 123.456.789.012 in our example. If, on the other hand, you are dialing an ISP and getting a different IP address each time (most likely), you will want to change the local value to 0.0.0.0. We also recommend filling in the remote address. Sometimes this is the address of your ISP's Internet gateway, for example 204.49.54.1, but it could also be the address of the remote access server you dial into. Check with your ISP to see if you need to set this value.

You do not need to have the FIFO argument on the third to last line of the file contents. This value lets diald talk with a few programs that come with the diald distribution for monitoring activity. If you have problems with performance or if ifconfig reports a lot of errors on the PPP interface, you will probably want to remove the FIFO option.

Accounting-log is also an optional argument. This tells diald to write information about call duration to a file. You can use this to find out exactly how long your modem has been in use.

Below is part of our /etc/diald/diald.conf file. You should be aware that this is only a partial listing.

```
# Device where your modem is connected
device
/dev/ttyS1

# Log file
accounting-log /var/log/diald.log

# Monitoring queue
fifo /var/run/diald/diald.fifo

# We use PPP as encapsulator
mode ppp

# Local IP (When you connect,
this address is automatically
modified
# with the IP assigned by your
ISP if you use the dynamic
option).
local 127.0.0.5

# Remote IP (When you con-
nect, this address is automati-
cally modified
# with the IP of the remote
server that receives our call).
remote 127.0.0.4

# Subnet mask for the wan link
netmask 255.255.255.0

# The IP addresses will be assigned when con-
nection starts.
dynamic

# If link goes down by remote end, start it
again only if there are
# outgoing packets.
two-way

# When link is up, route directly to the real
ppp interface, not the proxy
# interface. Not to do this is a performance lost
of about 20%.
# There are old kernels that do not support
reroute. See diald manual for
# more information
reroute

# Diald will set up the default route the SLIP
interface used as proxy

defaultroute

# We connect over a modem. WARNING: Do
not specify this option in the
# ppp options file, because they will conflict
with the diald options. To
# see what ppp options that you can not use in
the pppd-options option,
# see the diald manual page and search for
pppd-options
modem
crtscts
speed 115200

# Some timers and retry options
# See Diald man page for more information
```


File Edit Settings
Back Up
Location: /etc/rc.d
rc.d
rc0.d
rc1.d
rc2.d
rc3.d
rc4.d
rc5.d
rc6.d
rc.firewall
rc.local
rc.sysinit
2,230 bytes in 1 file
File Search Settings
/etc/rc.d/rc.firewall Col 0 2230 bytes 6%
rc.firewall - Initial SIMPLE IP Masquerade test for 2.1.x and 2.2.x
kernels using IPCHAINS
Load all required IP MASQ modules
NOTE: Only load the IP MASQ modules you need. All current IP MASQ
modules are shown below but are commented out from loading.
Needed to initially load modules
/sbin/depmod -a
Supports the proper masquerading of FTP file transfers using the PORT
method
/sbin/modprobe ip_masq_ftp
Supports the masquerading of RealAudio over UDP. Without this module,
RealAudio WILL function but in TCP mode. This can cause a reduction
in sound quality
/sbin/modprobe ip_masq_raudio
Supports the masquerading of Quake and QuakeWorld by default. This
module is for multiple users behind the Linux MASQ server. If you
are going to play Quake I, II, and III, use the second example.
#Quake I / QuakeWorld (ports 26000 and 27000)
#/sbin/modprobe ip_masq_quake
#Quake I/II/III / QuakeWorld (ports 26000, 27000, 27910, 27960)
/sbin/modprobe ip_masq_quake 26000,27000,27910,27960
Supports the masquerading of the CUSeeme video conferencing software

Use an IP MASQ firewall to make sure no one can hack into your system from the Internet.

```
connect-timeout 120
redial-timeout 60
start-pppd-timeout 120
died-retry-count 0
redial-backoff-start 4
redial-backoff-limit 300
dial-fail-limit 10
```

Reboot your PC when you finish making the necessary adjustments to your diald program to make diald active.

■ **Protect Your Connection.** At this point, both your Ethernet network and your PPP dial-up connection to the Internet should be working. Now you'll want to take a few steps to protect your network from intrusion.

IP Masquerading. In order for your LAN IP addresses to communicate with the Internet, they need to be translated into Internet IP addresses. The NAT (Network Address Trans-lation) standard can accomplish this translation, letting your entire network use its own set of internal IP addresses and a different set of external IP addresses. NAT also provides a type of firewall for your network that will prevent unauthorized access.

IP Masquerading, which is also called IP MASQ, is a form of NAT. It provides a way for you to use a single valid IP address for all of your private addresses in your network, while at the same time fully connecting you to the Internet. IP MASQ doubles as a simple firewall for the shared Internet connection. We'll create the configuration file IP MASQ needs to load all the necessary modules.

Create the file /etc/rc.d/rc.firewall with the following initial simple ruleset. This file is quite long, but very necessary. All lines that begin with a pound sign (#) are ignored.

```
# rc.firewall - Initial SIMPLE IP Masquerade
# test for 2.1.x and 2.2.x
# kernels using IPCHAINS
# Load all required IP MASQ modules
# NOTE: Only load the IP MASQ modules
# you need. All current IP MASQ
# modules are shown below but are
# commented out from loading.
# Needed to initially load modules

/sbin/depmod -a

# Supports the proper masquerading of FTP
# file transfers using the PORT
# method

/sbin/modprobe ip_masq_ftp

# Supports the masquerading of RealAudio #
over UDP. Without this module,
# RealAudio WILL function but in TCP mode.
# This can cause a reduction
# in sound quality

/sbin/modprobe ip_masq_raudio

# Supports the masquerading of Quake and
# QuakeWorld by default. This
# module is for multiple users behind the
# Linux MASQ server. If you
```

```
# are going to play Quake I, II, and III, use the
# second example.

# Quake 1 / QuakeWorld (ports 26000 and
# 27000)

/sbin/modprobe ip_masq_quake

# Quake 1/II/III / QuakeWorld (ports 26000,
# 27000, 27910, 27960)

/sbin/modprobe ip_masq_quake
26000,27000,27910,27960

# Supports the masquerading of the CuSeeme
# video conferencing software

/sbin/modprobe ip_masq_cuseeme

# CRITICAL: Enable IP forwarding since it is
# disabled by default

echo "1" > /proc/sys/net/ipv4/ip_forward

# CRITICAL: Enable automatic IP
# defragmenting since it is disabled by
# default in 2.2.x kernels

echo "1" >
/proc/sys/net/ipv4/ip_always_defrag

# Dynamic IP users: enable this following
# option. This enables dynamic-
# IP address hacking in IP MASQ, making life
# with Diald easier.

echo "1" > /proc/sys/net/ipv4/ip_dynaddr

# MASQ timeouts
# 2 hrs timeout for TCP session time-
outs
# 10 sec timeout for traffic after
# the TCP/IP "FIN" packet is
# received
# 160 sec timeout for UDP traffic
# (Important for MASQ'ed ICQ
# users)

/sbin/ipchains -M -S 7200 10 160

# Enable simple IP forwarding and #
Masquerading
# NOTE: The following is an
# example for an internal LAN
# address in the
# 192.168.0.x network with a
# 255.255.255.0 subnet mask.

# Please change this network
# number and subnet mask to
# match your internal LAN setup

/sbin/ipchains -P forward DENY
/sbin/ipchains -A forward -s
192.168.0.1/24 -j MASQ

# End of File
```

Now that you have this file put together, you want to make it executable by typing chmod 700 /etc/rc.d/rc.firewall.

You will want this rule set to run each time you start your Linux box. The easiest way to do this is to add echo "Loading the rc.firewall ruleset.." /etc/rc.d/rc.firewall in the /etc/rc.d/rc.local file. The only drawback to this is that the firewall will not start until near the end of the boot process. For our example, dialing up with a modem, this isn't a problem because there is no external connection to our system until the modem dials out. By that time, the firewall rule set is already running.

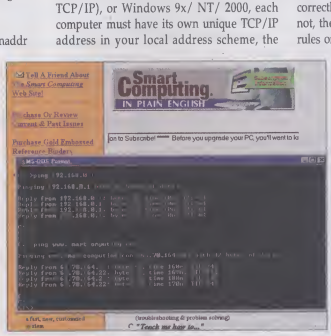
Using the Red Hat Network Monitor is a good way to test your dial-up interface and to see traffic move in and out of your system.

■ **Take It On A Test Run.** Now that you have your Linux system up and running and all of your services configured and ready to go, it is time to test things out.

Regardless of the computer on your local network, be it Macintosh, Windows 3.1 (with TCP/IP), or Windows 9x/ NT/ 2000, each computer must have its own unique TCP/IP address in your local address scheme, the same subnet mask as your Linux box (255.255.255.0 for a Class C as in our example), and default gateway (the address that you want all of your traffic to go to). The default gateway will be the address of your Linux server; 192.168.0.1 in our case. You will want to give each computer an address for its DNS, too. If you run DNS services on your Linux server, then enter that address. If you use an external server, like most of us, then enter the IP address of your ISP's DNS server.

When everything is set up and ready, you should test basic connectivity between computers. First, try to ping the Linux gateway from a PC by going to a command prompt and typing ping **192.168.0.1** (substitute your Linux box's IP address). You should receive replies right away. Next, open a terminal session on the Linux box and try to ping your ISP's default gateway. For us, it is 204.49.54.1. This should bring up the modem and PPP interface. If all goes well, the modem will be connected, and you will be able to ping your ISP.

Now go back to your desktop and try to ping the same address you just entered on the Linux box: your ISP. If everything is working correctly, you should again receive replies. If not, there is a problem in your IP forwarding rules on the Linux box. If you receive replies, take it one step farther and try to ping a domain name such as www.smartcomputing.com. This will test your domain name resolution. Lastly, assuming the DNS is working, open your browser and try to surf to a Web site. If you've followed our steps, you should be surfing just fine.



To make sure that everything is working properly and outbound traffic flows as it should, ping your Linux firewall and a favorite Web site.

■ **Reap The Rewards.** Setting up Linux can be frustrating and rewarding at the same time. Using an older PC to share an Internet connection is a great way to save the cost of multiple phone lines and ISP accounts. Take your time and do your homework, and Linux can go to work for you. GS

by Keith Schultz

Troubleshoot Your Linux System

Expert Advice To Help Solve Your Problems

By now, you've installed Linux or at least tried to. However, odds are that not everything went 100% according to plan. If your idea of troubleshooting is to uninstall and reinstall a peripheral in Windows' Device Manager, you may be in for a rude awakening.

But you're in good hands here. We wanted to get the inside scoop on troubleshooting Red Hat 7.0, the newest distribution from the Linux market leader. When we learned Red Hat technical engineer Jeff Goldin's nickname was "Crash," we knew we'd come to the right person for help with putting together a worthy troubleshooting guide. With Goldin's help, we've assembled a list of the most common support issues that Red Hat 7.0 users encounter.

We should note we've used Red Hat Linux 7.0 as our sample distribution not because it's filled with bugs and troubles—because it's not. Red Hat makes one of the best Linux operating systems on today's market. If anything, we offer these support items so you can feel more comfortable in selecting a prominent Linux incarnation and knowing that most of your questions have already been answered.

Getting Started

Q Most experts say computer problems can be averted with more careful planning. Is this true with Red Hat Linux?

A You bet, starting with just buying the wrong product. We have three products on shelves these days, beginning with the Standard box set, which is considered for expert users, but it has such a low price tag ($29.95) that users who shouldn't be buying that product are. See, Standard doesn't have the documentation in a hard copy format. We include a documentation CD that has it all, but you have to be able to install and run the operating system to get access to it. The other products we sell, Deluxe and Professional, have the hard copy install, reference, and getting started guides already printed out. So, if you're not 100% familiar with this stuff, don't buy the cheaper product. We recommend novice users get the Deluxe for $80. [Professional has all the Apache server stuff.] It's got 30 days of phone support; call us up and we'll help you get the box installed.

Q New users are going to land at an unfamiliar prompt and have no immediate GUI (graphical user interface) that will help them feel their way around. Instructions like how to "mount" a drive may be meaningless. Does the documentation get people past this stage?

A Yes, but many people don't read it. The typical questions we get are very well-documented. We have a whole documentation department, in fact, and if you've ever seen our documentation, it's not thin. It's a whole book with screen shots and pictures.

Don't have a Linux-compatible CD-ROM drive? If you're on a standalone PC and find your CD-ROM drive won't install Red Hat Linux, don't give up. Your first order of business is to create a FAT (file allocation table) 16 partition that is large enough to accommodate the Red Hat Linux **RPMS** directory. (According to Red Hat, RPMS stands for RPM Package Manager. RPM enables the installation, upgrading, and removal of packages, which are the programs that form the Red Hat Linux OS.) Creating this partition is easy enough to do from a DOS screen with the FDISK utility, assuming you still have unpartitioned room on your hard drive. (You can still access a DOS command prompt in most Windows versions by pressing F8 during bootup.) If not, you'll need to use a third-party utility, such as PartitionMagic.

For our example, let's say your new FAT 16 partition is E: and your CD-ROM drive is F:. You'll need to create two new directories and transfer the appropriate CD directory contents into them. This is done in five steps:

1. Create the RedHat directory:
   Type **mkdir e:\RedHat**
2. Create the base subdirectory:
   Type **mkdir e:\RedHat\base**
3. Create the RPMS subdirectory:
   Type **mkdir e:\RedHat\RPMS**
4. Transfer the base contents from CD-ROM to the hard drive: Type **copy f:\RedHat\base e:\RedHat\base**
5. Transfer the RPMS contents from CD-ROM to the hard drive: Type **copy f:\RedHat\base e:\RedHat\RPMS**

From this point, merely begin the installation from your E: drive and opt for a hard drive install.

Installation crashes? There are many possible reasons for this, but one of the most common is that the user mistakenly

directed the installer to mount a non-Linux partition. Red Hat offers an updated disk image that you can operate like a bootable. See http://www.redhat.com/support/errata/RHBA-2000-084-04.html for downloading and implementation instructions. This bug patch also cures several other problems, including the detection of missing or corrupt RPMs.

I have trouble booting. How do I create a boot disk? There is a command in the DOSUTILS directory of your Linux CD called rawrite designed for this purpose. You'll need to first boot into DOS or enter a DOS window. Browse to your CD-ROM drive, get into the DOSUTILS directory, and run Rawrite.exe. The program will prompt you for a boot image disk. Type **\path\to\boot.img**. Run the program a second time, and when similarly prompted, type **\path\to\supp.img**.

Installation keeps returning a "mount failed" error. This usually results from improper labeling of your partitions. Your partition for a full installation should be named either ext2 or Linux Native as determined by your partitioning tool. Try accessing Install Log (press CTRL-ALT-F3) or System Log (press CTRL-ALT-F4) to investigate this. In an upgrade installation, hop into a virtual terminal and double-check that none of your partitions is mounted. Also, make sure the fs types given in /etc/fstab also don't show up in /proc/filesystems.

Red Hat Linux upgrade won't find a valid RPM database. This is a classic case of software being so outdated that the newest version doesn't recognize components of it. Your existing version of Red Hat Linux constructs the RPM database in a format that seems corrupt to newer editions. However, you can fix this by rebuilding the RPM according to Red Hat Linux 7's format in three steps:

1. Mount the new CD-ROM by typing **mount /mnt/cdrom**
2. Upgrade the RPM from the CD-ROM by first typing **cd /mnt/cdrom/RedHat/RPMS** and then **rpm -Uvh —nodeps —force rpm-*rpmpm**
3. Finally, issue the command to rebuild the database by typing **rpm —rebuilddb**

LILO (Linux Loader) could not write to the master boot record. Two BIOS (Basic Input/Output System) settings may interfere with **MBR** (master boot record; the section of a drive that is reserved for saving information needed to boot up the computer) writing. The first is BIOS-level virus protection. Most vendors disable this setting by default, but there are always exceptions and accidents. Second, your BIOS may have a setting that specifically write-protects the MBR. In both cases, make sure the setting is disabled.

The other likely possibility is that another incompatible boot loader is already in the MBR. To force LILO into place, start by booting with a Linux boot disk, and then at the prompt, type **vmlinuz root=/dev/hdX**, where "X" is the specific drive and partition location. This will get you into Linux. Now, bring up the /etc/lilo.conf file and check for errors. Red Hat offers the following example of what a good script should look like:

```
boot=/dev/hda
map=/boot/map
install=/boot/boot.b
prompt
timeout=50
image=/boot/vmlinuz-2.2.12-20
label=linux
root=/dev/hdaX [X is the target root location]
read-only
```

If everything checks out, run **/sbin/lilo -v -v** and reboot. This should entrench LILO in your MBR so you can dual-boot normally.

Hardware-Compatibility Issues

Q So, if a user can get the OS installed, where is the next major problem spot?

A Our other biggest problem is that customers buy hardware that may not be fully compatible with Linux. Make sure before you buy Linux or buy a computer to run Linux [you] look at our Web site, which has a list of supported hardware. Nothing will drive you more insane than trying to get Linux installed when you're not familiar with it and you have a video card that just isn't going to let you get to the GUIs.

Q Besides checking the compatibility list, are there other guidelines Linux hardware shoppers should follow?

A Stay away from anything that is software-driven or has the word "Win" in its title. I know that sounds horrible, but unfortunately, the way all that hardware works is being dumb, as we say in the industry. It doesn't know how to do things. You have to load up programs and drivers to tell it, 'You're a modem, here's how you act.' That doesn't exist on the Linux side. Linux won't know what to do with that piece of hardware; that's why we recommend devices with **jumpers** [on/off switches, once extensively used on circuit boards to alter hardware configurations, that are composed of wires and a small metal piece]. They're just a lot more straightforward to work with. And, we also recommend external devices for the same reason. You plug them into your serial port and, for the most part, you're going to be up and going.

Q Does Red Hat Linux support USB (Universal Serial Bus)?

A USB is something we're just getting to. With the new 7.0 product, we're having some limited support. But since we're just incorporating it, we're on keyboards, mice, and some other serial devices. Like if you've got a PDA (personal digital assistant) cradle, for the most part, those are working in Linux. Some USB cameras work, but a lot of fancy USB devices like USB network cards and other things . . . we're not there yet.

IDE hard drive name-calling. One of the first things most DOS/Windows users do upon being first dropped into Linux is to revert to the lowest common denominator and type C:. However, Linux uses a more descriptive system for drives than merely assigning letters, so the idea of C: is meaningless.

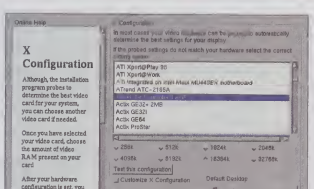
Instead, Linux uses a three-letter name followed by a number. The first two letters are either sd or hd, where sd denotes a SCSI (Small Computer System Interface) hard drive

and hd an IDE (Integrated Drive Electronics) drive. The third character notes the specific position of that drive in the system. For IDE drives, remember that each IDE channel has the capacity for two drives, a master and a slave as dictated by the drive's jumpers. Most PC motherboards support two IDE channels, a primary and a secondary. The drive name for the primary master is hda, the primary slave is hdb, the secondary master is hdc, and the secondary slave is hdc.

Furthermore, a number is added to the end of this name to note the partition within the drive; most drives can support up to 16 partitions. Numbers 1 through 4 are primary partitions while 5 through 16 are logical partitions.

Can't see the CD-ROM drive? Red Hat Linux 7 is generally very good about recognizing IDE CD-ROM drives, but there are some situations where it struggles, most notably with older drives that deliver data Linux interprets as errors or in cases where the BIOS can't recognize the drive's IDE channel, as in systems that use a third or fourth IDE channel.

You can use LILO to fix this problem. At a boot: or LILO: prompt, type **linux hdX=cdrom**, where "X" is the proper Linux drive location as outlined above.


Online Help
X Configuration
Although, the installation program probes to determine the best video card for your system, you can choose another video card if needed.
Once you have selected your video card, choose the amount of video RAM present on your card
After your hardware configuration is set, you can test your settings
You can also choose
Hide Help
Configuration
In most cases your video hardware can be properly and automatically determine the best settings for your display.
If the probed settings do not match your hardware select the correct video server.
ATI Xpert@Play 98
ATI Xpert@Work
ATi integrated on Intel Asus MEW4BEN motherboard
ATrend ATC-2165A
Actix GE32+ 2MB
Actix GE32i
Actix GE64
Actix ProStar
2Mb
4Mb
8Mb
16Mb
32Mb
64Mb
128Mb
Test this configuration
Customize X Configuration
Default Desktop
Use Graphical Login
GNOME
Skip X Configuration
Back
Next

Although Linux still lags behind Windows for industry-wide video driver support, companies like Red Hat are making progress in supporting the newest video products. Here, Red Hat's X Configuration utility helps to set up the proper configuration for your hardware.

More Hardware Configuration

Q What's the first big hurdle people face after a successful installation?

A Probably getting their sound card and modem up and running. We've included two separate utilities to configure each of those things. In Linux, unfortunately, there is no magic tool that will configure everything for you [because] there are separate tools for different things. The trick is knowing which commands and which programs perform which functions. In the case of the sound card, we have a program called sndconfig. That's a tool that, if you have a Plug-and-Play sound card or any sound card that's supported, it'll say, 'I'm going to play a test for you. Let me know if you hear it.' If you hear the tests, boom—you're good to go. Sometimes, there's a manual configuration needed if you have multiple Plug-and-Play devices. You have to know which IRQs [interrupt request lines] go to which devices and all that stuff. Windows takes care of this for you, but Linux makes you know the answers.

Q With so many games now being ported over to Linux, users need a wide range of video card compatibility and functionality. Is Red Hat Linux supporting this yet?

A There are utilities available so you can do 3-D acceleration, depending on your video card. But after that, there is no general case because each video card has different instructions. So, the best place to go for help is back to the card vendor, and their instructions will vary based on which distribution you're using because the windowing environment may be different.

Sndconfig isn't working. Sndconfig attempts to establish stable Plug-and-Play values for your sound card, but this isn't always successful. If you're pretty handy with IRQs and other system resource settings, try disabling sndconfig's default settings by typing **/usr/sbin/sndconfig — noautoconfigg**. Now you can manually input values. You'll find the Windows' standard resource values in use at cat /proc/interrupts, cat /proc/dma, cat /proc/pci, and cat /proc/ioports.

If you're using a Plug-and-Play ISA (Industry Standard Architecture) sound card, consider trying the isapnptools applications by typing **/sbin/pnpdump > /etc/isapnp.conf**. This will provide a list of settings for all Plug-and-Play devices. Check this and make sure your sound card isn't conflicting with other devices. To set up the sound card, type **/sbin/isapnp /etc/isapnp.conf**.

Particularly old sound cards may not be Plug-and-Play-compliant, but the card's documentation should help you pinpoint its preferred settings. You can then manually establish these by editing /etc/conf.modules. Noting the card's parameters can be a bit tricky, so type **man isapnp.conf** for a detailed explanation of how to configure settings. Once you understand how to adjust resources, start tinkering with the configuration by typing **/etc/rc.d/init.d/sound stop** and then **/etc/rc.d/init.d/sound stop /etc/rc.d/init.d/sound start**. Expect to run through this a few times until you hit on a functioning set of parameters.

No local printer found. Often, printtool will fail to recognize parallel printers on your PC. The most immediate fix for this is to add a line to your /etc/conf.modules files. Type **alias parport_lowlevel parport_pc**. With this change made, type **/sbin/rmmod lp** and execute printtool.

The alternative is to download the most current modutils RPM from ftp://rawhide.redhat.com/pub/rawhide/i386/RedHat/RPMS/ and follow Red Hat's installation instructions.

Dual-Boot Issues

A Can Windows and Linux really co-exist peacefully on the same machine?

Q Sure. Linux is more flexible about how it can be installed and where it can be booted than Windows. The only catch is that most people's entire hard drive has been partitioned to Windows. The problem is that Linux can't just go on top of that because it doesn't want to delete your data or anything like that. So we've included a small utility that will let you resize your Windows partition called fips. You run it as a DOS utility from our CD in the DOSUTILS directory. It'll allow you to move all your data to one Windows partition, thus freeing up a bunch of hard drive space you can install Linux to.

A In situations where a user installs Linux to a second drive, does it matter which OS is on the primary and secondary drive?

Q Yes, it does, and it's all Windows' fault. Windows is very particular about where

it lives. It likes being in the first partition on the first hard drive. Red Hat Linux is just fine taking second chair, though. Using a second drive is actually a much simpler setup. You don't even have to run fips. Just install the hard drive and away you go. That's personally what I do.

Accidentally installed Linux to your primary partition? If so, odds are your machine locks while booting. Luckily, Red Hat has a workaround for this that involves modifying the Windows entry in the lilo.conf file. Make sure the new version reads as follows:

```
other=/dev/hdb1
label=dos
table=/dev/hdb
map-drive = 0x80
to = 0x81
map-drive = 0x81
to = 0x80
```

Now, type **/sbin/lilo** to execute LILO and kick in the new instructions.

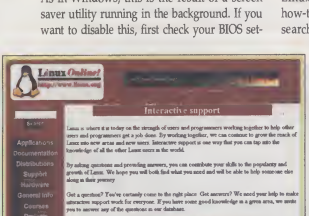
Windows applications won't work. Simply put, they're not supposed to because Windows and Linux are fundamentally incompatible. However, that hasn't stopped a couple of third-party developers from developing "virtual machine" environments that allow Windows applications to run in a sort of insulated shell within Linux. The first is the Wine project (http://www.winehq.com), which is a freeware effort to create a Win32-compliant API (application program interface) that can run any Windows application under Linux. The other is VMWare 2.0 for Linux ($99 for students and "hobbyists;" http://www.vmware.com), which is a more stable product that allows Linux and Windows to run simultaneously.

Uninstalling & Other Issues

Q Windows is notorious for messy uninstalls. Are there problems associated with uninstalling Linux?

A One of the key things Linux needs to boot up is called the Linux Loader, which is more affectionately known as LILO. LILO is a boot loader. One of the nice things about LILO is it will allow you to install and run multiple OSes, including Windows. The problem is that when you remove Linux from the system, that program is still installed in the MBR. Typically, users have a problem removing that. They'll see a little error message after they reboot because the boot loader is looking for the information that's been removed from the system. Now, there's a way around this. If you have access to a DOS FDISK utility, if you use the command **fdisk /mbr**, that reinstalls the master boot record, thus removing LILO. Problem solved. And you want the easy way to uninstall Linux? Just remove the partition. It's that easy.

The screen goes blank after no activity. As in Windows, this is the result of a screen saver utility running in the background. If you want to disable this, first check your BIOS set-



Still need more Linux help? Head to Linux Online and type in your natural-language question.

tings and adjust any appropriate power-management features. In Red Hat Linux, you can log in as root and type **ntsysv**. From here, disable APM (advanced power management), exit ntsysv, and then reboot.

Rpmfind isn't working behind a firewall. First, you want to make sure you're using a version of rpmfind that is newer than 1.6. If not, download a newer edition and then rebuild it with the command **rpm —rebuild rpmfind-1.6.src.rpmm**. This will create an installable rpm binary.

If this doesn't fix the problem, try **edit ~/.rpmfind** and modify the httpProxy and/or ftpProxy settings to reflect the following link: **httpProxy=http://myhttpproxy:3128**.

Forgotten password. This situation is no problem. When you reach a LILO prompt, type **linux single**. Linux replies back with a # prompt. Now, type **passwd root** to update your password. From here, you should be able to reboot with the new password in place.

Looking Beyond Red Hat

Q What happens if I have a problem and I can't find the answer at Red Hat?

A Well, we do find that a lot of Linux people are really independent. Some would rather hunt for answers than ask for help by phone, which is fine. If that's you, make your first stop http://www.linuxdoc.org. That's the Linux Documentation Project. They've got how-tos, FAQs (frequently asked questions), search engines, [and] translations into other languages. Of course, I'd prefer people come to my site first, but there's just loads of information out there for people who want to solve their own Linux problems.

What are some other resources for troubleshooting Linux? The open source community is extremely supportive, and bug solutions are posted at Red Hat, as well as other Linux forums virtually as soon as they're discovered. Also, make a habit of periodically checking Red Hat support for patch files and service packs. Version 7.0 is still new enough that such additions haven't had much time to accumulate, but they will come as the platform continues to grow and improve.

What we've discussed here are only a few of the many issues that you may encounter when starting out with Linux. If you need more help, here are some of the best locations we've found:

Red Hat Support (http://www.redhat.com/support), Red Hat Knowledge Base (http://www.redhat.com/knowledgebase), and Linuxnewbie.org (http://www.linuxnewbie.org).

Linux Online (http://www.linux.org) offers a support section that you can use to ask natural-language questions, and real-life Linux experts will reply with any possible information. Another excellent source for Linux troubleshooting are newsgroups that deal with Linux, particularly alt.os.linux.redhat. GS

by William Van Winkle

Top Tools

What You Need To Work & Play On Your Linux System

Although many commercial software developers haven't yet embraced the Linux platform, you will find an adequate selection of products in most major categories. In this roundup, we'll take a look at some of the most popular products for home and small-business Linux users.

Business & Productivity. At the core of any business- or home-productivity package are such basic programs as a word processor, spreadsheet application, and a database program. Although Microsoft Office has held the lead in this product category for a while, you won't find it available for Linux (at least, not yet). However, there are plenty of other office tools from which to choose.

Anyware Office. VistaSource's Anyware Office ($99; http://www.vistasource.com) builds on the Applixware Office Suite (see below). Anyware Office provides complete access to your Applixware Office applications and document files from any computer with a Java-enabled browser, regardless of the type of computer or operating system. With this software installed, you don't need to carry a notebook or remember to bring files with you when you travel or work from home.

Applixware Office 5.0 Standard Office Suite. VistaSource's Applixware Office 5.0 ($99; http://www.vistasource.com) includes the expected word processor, spreadsheet, and presentation programs, plus Applixware Data, which is a database SQL (structured query language) tool that works with any ODBC (open database connectivity)-compliant database. Applixware Office also includes a graphics program, e-mail client, and application builder, and can import and export a wide variety of file formats.

CyberScheduler For Linux. CrossWind Technologies' CyberScheduler For Linux ($49.95; http://www.crosswind.com) brings a full-featured PIM (personal information manager) to your desktop. In addition to checking your own calendar, you also can check your coworkers' calendars, making scheduling meetings a breeze. CyberScheduler includes a to-do list that supports recurring items, and you can use it as a task manager for scheduling projects.

StarOffice 5.2. StarOffice from Sun Microsystems (free download; http://www.sun.com) boasts one of the best available collections of office tools, but better yet, it's free. StarOffice includes a professional word processor; a high-performance spreadsheet, which includes built-in stock-management templates; a presentations program; a vector-based drawing program; a PIM that has built-in synchronization support for Palm PDAs (personal digital assistants); an integrated e-mail client; and a powerful database-management tool. StarOffice can import and export an impressive variety of common file formats so you'll be able to exchange data with clients and colleagues easily.

WordPerfect Office 2000 For Linux. Long the only real competitor of Microsoft Office, Corel's WordPerfect Office is available in Standard and Deluxe editions ($149 deluxe, $99 standard; http://www.corel.com) for Linux. Both include the same core tools: WordPerfect 9 (word processor); Quattro Pro 9 (spreadsheet); Corel Presentations 9; CorelCENTRAL 9 (information manager); Netscape Navigator; and a collection of fonts, clip art, and photos. The deluxe edition adds Paradox 9 (a relational database); Netscape Communicator; Railroad Tycoon II Gold Edition Limited Version (game); and additional fonts, clip art, and photos.

A slightly older version of Corel's word processor, WordPerfect 8, is available as a free download for personal use. WordPerfect 8 includes a grammar checker, revision tracker, and charting and drawing tools.

Xess Spreadsheet For Linux. Business Logic's Xess Spreadsheet For Linux ($69.95; http://www.blcorp.com) can easily exchange files with most popular spreadsheet programs, including Lotus and Microsoft Excel. Xess also features extensive tools for both financial and science/engineering applications, with a full range of mathematical, statistical, financial, matrix, and string functions. Xess also includes 3-D workbooks, live charting and graphing, and goal-seeking tools.

Graphics & Desktop Publishing. Most of the major players for Windows and Macintosh are noticeably absent from the Linux world, but many other powerful graphics programs are available that can help you get your artwork done.

Artstream. Mediascape's Artstream ($395; http://www.mediascape.com) is a vector-based paint program. Artstream's tools bring the object-level power that is common to vector drawing programs to the bitmap paint and detail level. Artstream also supports unlimited layers and resolution. Artstream's floating palette interface and support for popular Macintosh and Windows formats and tool conventions make the program easy to learn.

CompuPic. CompuPic from Photodex ($39.95, free for nonbusiness use; http://www.photodex.com) is a graphics file manager and file browser. CompuPic creates thumbnails of every graphics file contained within a directory and includes a viewer that lets you view your files either full screen or within a window. You also can make quick edits; sharpen or blur graphics; rotate, resize, and crop; adjust color and brightness; remove red eye; and add text.

CorelDRAW Graphics Suite For Linux. Corel brings its legendary graphics programs to Linux with CorelDRAW Graphics Suite For Linux ($199; http://www.corel.com). CorelDRAW's intuitive tools and one of the best available drawing interfaces make it easy to create professional-quality graphics and documents. Plus, CorelDRAW Graphics Suite can save and open files in a wide variety of formats, ensuring compatibility with most applications and operating systems.

FrameMaker. Adobe's FrameMaker ($799; http://www.adobe.com) is designed for long-document, content-rich, or multiple-author and group-document design. FrameMaker also provides advanced book-building features, which makes it a great choice for producing manuals and general publishing. If you need to publish in **SGML** (Standard Generalized Markup Language; a formatting language that allows the transfer of information between applications), FrameMaker+SGML ($1,449) lets you worry more about your content, rather than learn the difficult SGML.

■ **Utilities.** Most Linux distributions include a selection of utilities, most of which are usually geared toward tuning or modifying the Linux operating system itself. Here, we'll look at utilities that are useful for general, routine maintenance, or emergency tasks.

Adobe Acrobat Reader. Adobe's Acrobat Reader (free download; http://www.adobe.com) is a must-have program for any computer system and any level of user. Many products sold today and many Web sites include documentation in PDF (Portable Document Format) format, and Adobe Acrobat is the preferred reader for viewing and printing these documents.

BRU: Backup And Restore Utility. Unlike many backup utilities for Linux, Enhanced Software Technologies' Backup And Restore Utility ($79 [personal edition], $299 [commercial edition]; http://www.estinc.com) provides complete data verification during the backup process. BRU also includes error detection and recovery capabilities, letting you successfully restore data even from marginal data sources. Additional features include a tape counter, which keeps track of how many times a backup tape has been used, and complete backup support for all types of files. A companion utility, CRU: Crash Recovery For Linux (free download), uses an uncomplicated and quick recovery method to restore your Linux system after a crash or hardware failure.

Kaspersky's Anti-Virus (AVP) For Linux. Kaspersky Lab's Anti-Virus (AVP) For Linux Workstation ($49.95 [per user per year]; http://www.kaspersky.com) includes three basic components: the antivirus scanner, which is a traditional tool that checks files and drives on demand; the antivirus daemon, which is a resident antivirus filter with an optimized downloading scheme in memory; and an antivirus monitor that will detect file operations and conduct a virus check whenever these events occur. These three modules, along with an automatic updating utility that keeps the virus database current, let you configure the level of protection you need for your workstation (a server version is also available).

Partition Commander. V Communications' Partition Commander ($29.95 [download], $39.95 [packaged]; http://www.v-com.com) lets you create, resize, and copy **partitions** (reserved portions of a disk or memory that function as separate units; a partition acts as a separate space, but physically, it is still part of the whole disk.) on your hard drive, without requiring you to understand how clusters, file allocation tables (FAT), or other aspects of your hard drive and file system work. Using Partition Commander's automatic partitioning system, you can simply specify the size and reason for a partition (more storage space, speed, operating system management, etc.), and Partition Commander will do the rest. If you discover the new partitions are not what you wanted, you can use the BackStep Wizard to reverse any changes you made. If you prefer to take manual control, Partition Commander will get out of your way and let you add, move, delete, resize, and copy partitions on your own.

PKZIP 2.51 For Unix. PKWARE's PKZIP ($119 [Linux version]; http://www.pkware.com) is one of the leading compression programs in the DOS and Windows environments that now comes in Unix/Linux versions. PKZIP For Unix supports viewing and extracting files in TAR (compressed tape archive), GZIP (a command for compressing TAR files), **Uuencode** (algorithms used to translate binary [or nontext files] into straight ASCII text and then back into binary code; Uuencode used to stand for Unix-to-Unix encode, but it has become widely used on a number of systems), **MIME** (Multipurpose Internet Mail Extensions; the standard format for attaching nontext files, such as graphics and spreadsheets, to text-based e-mail messages), and BinHex (an encoding scheme that converts binary data into ASCII characters) formats. You also can use PKZIP to create self-extracting Unix, DOS, and Windows archives.

QuickStart Data Rescue. QuickStart Data Rescue from Enhanced Software Technologies ($69) offers quick-and-easy data recovery after a PC crash. QuickStart works with almost any PC operating system, including Linux. The software comes with its own bootable diskette, so you can quickly recover data without first reinstalling an operating system. QuickStart supports a wide

VistaSource's Applixware Office 5.0 brings top-notch productivity to Linux systems.

variety of backup media, including hard drives, tape, and removeable cartridge-based media.

VMware. VMware's VMware ($299 [download], $329 [packaged]; http://www.vmware.com) creates virtual computers on your hard drive, allowing you to use one x86-based computer to run multiple operating systems. Each virtual computer has its own networking, file sharing, and dial-up services, just as if it were a physically separate computer. VMware is handy for testing products under multiple OSes or for accessing programs that are only available for a specific operating system.

■ **Internet Tools.** Most Linux distributions include some useful Internet tools, but you can never have too many. Check out these products to get help, manage your downloads, and deal with multimedia content.

IglooFTP Pro. IglooFTP Pro from Littleigloo ($29.95; http://www.littleigloo.org) is an FTP (File Transfer Protocol) client that uses an easy-to-use graphical interface. IglooFTP Pro supports drag-and-drop for sending or receiving files via FTP and features extensive firewall (software or hardware that limits certain kinds of computer access from a network or other outside source) support and remote directory caching for improved display speed.

Macromedia Flash Player. Macromedia's Flash Player (free; http://www.macromedia.com) is a browser plug-in that lets you view vector-based animation on the Web. Flash stores information as vector data rather than bitmaps, so graphics load faster and text is sharper. Flash also allows a single page to display many different views, each dependent on how you interact with the page. Flash content ranges from simple animations and navigation enhancements to complex e-commerce sites.

RealPlayer 7 Basic. RealNetworks' RealPlayer 7 Basic (free; http://www.real.com) lets you play and store digital music in a variety of formats. RealNetworks doesn't provide support, maintenance, upgrades, or fixes, but you will find a community support forum at http://realforum.real.com/cgi-bin/unixplayer/wwwthreads.pl.

■ **Multimedia Creation.** If you have been thinking about setting up and streaming multimedia content from your Linux-based Web server, the two programs below are good, inexpensive choices that will help you get your feet wet.

MainActor. MainConcept's MainActor ($85; http://www.mainconcept.com) is a highly acclaimed video editing and sequencer package. Its many features include titling, text overlays, video transitions, frame-by-frame editing, slide shows and presentations, editing and cleanup, capture from tape, digital video capture and output, and support for plug-ins.

RealProducer Plus. RealProducer Plus from RealNetworks ($149.95; http://www.realneworks.com/products/producerplus/info.html) lets you create audio and video streaming content for your Web site. As a powerful yet easy-to-use tool, RealProducer Plus is the perfect choice for both beginners and pros. Simple graphical tools and wizards make it a snap to set up and stream your content.

Enhanced Software Technologies' Backup And Restore Utility can pull you out of trouble in case catastrophe strikes.

■ **Security.** Linux systems are frequently used as front-end routers and interfaces to the Internet for small-office or home networks. Here are a few options that can help keep your network safe from prying eyes.

Gateway Guardian. Gateway Guardian from Merilus Technologies (free [Personal Edition], $265 [Professional Edition], $365 [VPN Edition]; http://www.merilus.com) uses a Java application to preconfigure your firewall settings. Once you run through the setup wizard, Gateway Guardian will write an entire Linux operating system and the custom firewall configuration on a standard diskette. Just pop the diskette into the computer you have chosen as your firewall and reboot.

Gateway Guardian Personal Edition provides basic security needs for a home or home-office network. The Professional Edition includes custom firewall settings, IP (Internet Protocol) masquerading, remote configuration, remote login, and a complete DHCP (Dynamic Host Configuration Protocol) server. Finally, Gateway Guardian VPN Edition includes support for virtual private networks to connect multiple office networks or to allow traveling workers to securely dial in to the company network.

NetMAX FireWall. Cybernet Systems' NetMAX FireWall products (http://www.cybernet.com) are available in three configurations. The basic installation, NetMAX FireWall ($39), includes a browser interface to configure and control the firewall software, local or remote administration capabilities, a DNS (domain name server), a DHCP server and client, and Internet connection sharing/NAT (Network Address Translation). FireWall Suite ($99) adds IP mapping and forwarding, as well as a Web proxy and cache system.

FireWall ProSuite ($279) adds a T1 interface, UPS (uninterruptible power supply) support, dial-in modem support, a larger Web proxy and Web cache system, and support for 128-bit SSL (Secure Sockets Layer) encryption.

Storm Firewall For Linux. Storm Firewall For Linux from Stormix Technologies ($99.95; http://www.stormix.com/products/firewall/index_html) is an easy-to-use solution for home- or small-office security. Storm Firewall's graphical interface makes setup quick, and its built-in wizard makes it easy as well. Storm Firewall also supports IP masquerading, which allows you to share a single Internet connection among multiple computers. Storm Firewall must run on a designated firewall computer that has two network interface ports, one to the Internet and one to your LAN (local-area network).

■ **Development.** No self-respecting Unix system would be without development tools, and Linux distributions maintain the tradition by including compilers, linkers, and other development tools. Although these tools are adequate, you can build a much more robust development environment with just a few additional products.

CodeWarrior. MetroWerks brings its powerful and well-respected development tools to the Linux platform with CodeWarrior for Red Hat Linux ($124.95; http://www.metrowerks.com). CodeWarrior's IDE (Integrated Development Environment) includes native C/C++ compilers, assemblers, and linkers, as well as an integrated project manager, editor, error management system, and file utilities.

Plus, you can easily share CodeWarrior project files and codes among multiple platforms.

PowerPlant. With PowerPlant ($49.95; http://thekompany.com), theKompany.com set out to provide a standardized, integrated software-development environment for Linux. Instead of assembling Linux libraries, compilers, and other tools from the many and widely varied open sources, theKompany.com put them together under one IDE.

■ **Motif.** Linux does not require the use of a windowing system, but most distributions include some form of GUI (graphical user interface). However, the motif version that comes with your distribution is not your only option. One of the long-time and popular standards for GUIs on Unix systems has been Motif, which is a set of look-and-feel guidelines created by the Open Software Foundation (http://www.opengroup.org).

Metro Link Motif Complete!. Metro Link's Motif Complete! ($149; http://www.metrolink.com) brings the power of the Motif windowing system to your desktop Linux system. Motif Complete! combines the three most popular implementations of Motif (1.2, 2.0, and 2.1) on one CD-ROM.

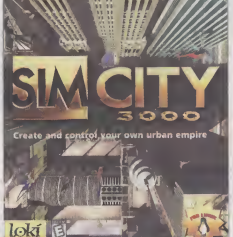
Open Motif Everywhere. The Deluxe and Professional editions of Red Hat Linux include Integrated Computer Solutions' Open Motif Everywhere (http://www.ics.com). Integrated Computer Solutions also offers Open Motif source code and binaries free through the Open Motif portal (http://www.motifzone.net). A CD-ROM version of Open Motif Everywhere ($29.95), with source code, binaries, manuals, and support is available from retail outlets.

■ **Server Applications.** If you're looking to complete some big Linux jobs, you'll need to look to one of these heavy-duty server application packages.

ColdFusion Server 4.5 Professional For Linux. Although a bit pricey for casual users, Allaire's ColdFusion Web application server ($1,295; http://www.allaire.com) delivers speedy application development through an easy-to-use, easy-to-understand tag-based language. ColdFusion supports connections to a wide range of database engines, letting you store data in the database of your choice and then access and modify that data via your Web site using the ColdFusion application server.

Domino Release 5 For Linux. Lotus combined its Domino application server with Linux (pricing varies; http://www.lotus.com) to create one of the most solid and powerful application servers available. Domino Mail Server supports the newest Internet mail standards along with Domino's messaging system. Domino Application Server is an open secure system for delivering collaborative Web-based applications. Finally, Domino Enterprise Server offers all the features of the Domino Mail and Application servers, with the added benefit of clustering for mission critical applications.

Mail-Gear. Symantec's Mail-Gear (pricing varies; http://www.symantec.com) provides policy-based e-mail and attachment scanning and filtering to help protect your business from liabilities. With Mail-Gear, you can rest assured that only approved attachments and documents are leaving or entering your network. Mail-Gear also includes powerful management tools that make setting up and defining accounts quick and easy.



All work and no play makes Linux a dull OS. Try a title like SimCity 3000 when you need a break.

■ **Games.** Almost every computer user likes to have a little fun, regardless of the operating system he or she runs. Games need no introduction, except to say yes, there are plenty of games available for Linux. Many leading PC games have been, or will be, ported to run on Linux. Loki Entertainment Software (http://www.lokigames.com) is one of the leaders in bringing games to Linux, so if you don't see what you want here, start at its site.

Civilization: Call To Power. Civilization: Call To Power from Loki ($34.95) is the latest in the Civilization family of games. You can build up your civilization from the Stone Age to the space age and then journey out among the stars. Call To Power is a strategy game, so you'll have to choose your methods wisely to build your civilization.

Descent3. Loki's Descent3 ($24.95) brings the 360-degree, twisting, turning, stomach-churning, seat-of-the-pants flying experience that has made the Descent series so popular to the Linux environment. With 10 new weapons and new fighting and flying options, Descent3 is still one of the premiere first-person games.

Myth II: Soulblighter. Loki Games brought Bungie Software's combination of adventure and strategy to Linux in Myth II: Soulblighter ($34.95). You command a ragtag army of sorcerers, soldiers, beserkers, and dwarves in the battle against the evil Soulblighter. Myth II supports network and online multiplayer gaming, so when you think you're the best, test your mettle against the rest.

Quake III Arena. Loki ported the latest version of id Software's first-person shooter, Quake III Arena, to Linux ($49.95). Quake III concentrates on the deathmatch mode of play, so if you don't have a network or the ability to play others online, you can still play against the bots. However, although the bots' artificial intelligence engine is good, there is no substitute for playing against real foes over a network. Get your friends together and see who will be the last one standing.

Railroad Tycoon II. Loki also offers a Linux version of Railroad Tycoon II Gold Edition ($39.95), which puts you smack dab in the middle of a real-time simulation of building a railroad industry, including big business, expansionism, and engineering. The game is set in the late 1800s, and you'll need to maneuver to control or gain access to steel, coal, textiles, and other resources your railroad will need. If the 1800s are not to your liking, try the Second Century expansion pack, which lets you focus on the rail industry from the 1930s through 2030.

SimCity 3000 Unlimited. The citizens of Megalopolis need your help and they need it fast. Natural disasters abound, pollution is out of control, and traffic is barely moving. Sound familiar? If you've ever thought you could do a better job of running your city than the local politicians, head to Loki's site and order SimCity 3000 Unlimited ($49.95) to put your skills to the test. With SimCity 3000, you can build your town from a small backwater to a large industrial city or anything in between. GS

by Tom Nelson and Mary O'Connor

Linux Online

Get The Help & Information You Need From These Online Resources

The Internet offers a wealth of resources for Linux users, from documentation, developer tools, and kernel updates to games, utilities, and desktop themes. Here's a brief look at a variety of useful sites for Linux users, whether you're brand new to Linux or a seasoned guru.

■ **For The Developer.** Both new and experienced Linux software developers will find plenty of resources on the Web.

LinuxDev.Net

LinuxDev.Net is both a destination and a portal for information about software development under Linux. The site includes a knowledge base, news, articles, classifieds, job listings, user discussions, and a bookstore.

http://linuxdev.net

Linux Programming

Linux Programming offers timely programming news and a large collection of resources, including code, development, libraries, toolkits, and hundreds of links to additional Linux information and resources.

http://www.linuxprogramming.com

MySQL

MySQL is an open source relational database system for noncommercial use. If you want to use the database for commercial purposes, you can license the product from MySQL. MySQL also provides training and support.

http://www.mysql.com

OpenDeveloper.org

OpenDeveloper.org is geared toward open source Web development. The site has information about using Linux or BSD with Apache Web server, MySQL, PHP, and Perl; code samples; how-tos; quick tips; and discussions.

http://www.opendeveloper.org

Sourcebank

If you're looking for source code or information for your next Linux project, you can usually count on finding it in Sourcebank's extensive collection of code, articles, and research papers. Sourcebank also includes community forums, e-mail newsletters, and links to some of the funnier comments they have found in source code.

http://www.sourcebank.com

■ **Downloads.** In the spirit of open source, there are many useful or interesting utilities, applications, games, and other goodies available for download on the Web.

AppWatch.com

AppWatch.com provides the latest news and information about free software and open source software for Linux. You can check an application's current version as well as its development history; most entries include a download link if you want to try out the software or update your version.

http://appwatch.com/Linux

CALEB15

CALEB15 specializes in links to tools for defeating Trojans, denial of service attacks, viruses, and other gremlins. In addition to security tools, CALEB15 offers downloads for many free operating systems, including Linux.

http://www.caleb15.com

DaveCentral

Every night, Dave roams the highways and byways of the Internet, searching for shareware, freeware, demos, and beta software to share with you.

http://linux.davecentral.com

freshmeat

At freshmeat, you will have access to new software releases as well as bug and security information. You will also enjoy freshmeat's editorials and informative message boards.

http://www.freshmeat.net

LinuxApps

LinuxApps is a popular resource for new and updated Linux releases. You can search for applications by name or keyword or browse the listings by category, date, popularity, or rating.

http://www.linuxapps.com

PenguinApps.com

PenguinApps.com offers a wide range of software downloads for the entire Linux community, from beginners to experts. Files are rated with one to five penguins, five being the best, and the most popular files and recently updated files are highlighted on the home page.

http://www.penguinapps.com

themes.org

themes.org is a one-stop solution for improving the interface of your X Windows system. You will find pictures, icons, and themes, as well as backgrounds for many windows managers, including KDE, Sawfish, Window Maker, and AfterStep. If you need help, visit the user forums for tips and feedback.

http://www.themes.org

TuxFinder

Do you know what you want but not where to find it? TuxFinder is a search engine for locating files on various FTP sites around the world. You can specify the file format to look for as well as the program name.

http://www.tuxfinder.com

Forums. The Linux community is particularly generous about sharing tips, help, information, and support. Here are some places you can give or receive information.

LinuxPlanet

LinuxPlanet offers active user discussions on many Linux subjects, including applications, drivers, and system setup. The site also features current Linux news and information, as well as tools and technical support.

http://www.linuxplanet.com

LinuxQuestions.org

LinuxQuestions.org is a free forum for the exchange of information about Linux. Its focus is on experienced users answering the questions of new users. The site organizes the forums into six Linux-specific topics and two catchall topics for non-Linux questions or comments. There is also a feedback forum for comments about the site.

http://www.linuxquestions.org

Games. If you thought Linux was only for enterprise and business use, you're in for a pleasant surprise.

LinuxGames

LinuxGames features extensive, well-organized lists of game reviews, news, and articles, as well as an active forum for discussing Linux gaming.

http://www.linuxgames.com

Linux Game Development Center

The Linux Game Development Center is packed with interviews, editorials, and programming and design information for both the experienced game developers who are new to Linux and those who are new to game development in general.

http://sunsite.auc.dk/linuxgames

The Linux Game Tome

The Linux Game Tome offers a varied collection of gaming news and a user-maintained database of Linux games. Site visitors can add game information and comments to the Tome. All game reviews include a rating based on user input.

http://www.happypenguin.org

Hardware. If you're having trouble getting some of your hardware to work with Linux, or you need to do some research before you buy new hardware, the sites listed below are good resources.

LinuxPPC

Linux can run on many hardware platforms, not just Intel x86 architecture. If you have a PowerPC (such as Apple, IBM, or Motorola), you will find everything you need to get Linux up and running on this site.

http://www.linuxppc.org

Linux Printing

Linux Printing provides a number of printer resources, including how-tos, a support database, man (manual) pages, driver listings, and a printer vendor list.

http://www.linuxprinting.org

Help & Troubleshooting. The sites below provide a variety of tips, documentation, and troubleshooting information to help you solve problems.

Linux Help.net

Linux Help.net contains well-organized lists of articles, message boards, Linux newsgroups, Linux IRC chats, how-tos, FAQs, distributions, and other information and resources.

http://www.linuxhelp.net/index.phtml

With the acquisition of Slashdot and freshmeat, Andover.Net is a powerhouse of Linux news, tools, how-tos, and feature articles.

LinuxHelp Online

LinuxHelp Online specializes in security news, distribution update alerts, FAQs, how-tos, forums, and links to other resources for finding information or answers to your questions.

http://www.linuxhelp.org

LinuxSelfhelp.com

LinuxSelfhelp.com features a directory-like interface. The site is well organized by category and topic and is completely indexed and searchable.

http://www.linuxselfhelp.com

Kernel Information. The Linux kernel is the heart of the Linux OS. To keep your installation current, check the sites below for updates and patches. If you want to play around with the kernel, you can also find the source code at these sites.

Linux Kernel Archives

You won't find any full distributions of Linux here, but if you want to work with the source, this is the place to get it.

http://www.kernel.org

Linux Mama

There are many places to find the official patches for Linux; Linux Mama is the best place to find the unofficial ones.

http://www.linuxmama.com

Linux Information & Portals. Keep abreast of the latest news and events affecting Linux and open source development with this collection of news and portal sites.

Andover.Net

Andover.Net claims to be the unbiased source for content, community, and commerce for the Open Source and Linux communities. With the acquisition of Slashdot and freshmeat, Andover.Net is a powerhouse of Linux news, tools, how-tos, and feature articles.

http://www.andover.net

HardcoreLinux

HardcoreLinux can help you pare down the unnecessary fluff that came with your Linux distribution. Use the Hardcore Linux Kernel Hacking how to, to get a lean, mean operating machine.

http://www.hardcorelinux.com

Linux.com

This megaportal from VA Research provides a comprehensive resource for learning about Linux. Users at all levels of experience are encouraged to participate in providing material and information to share with the Linux community.

http://www.linux.com

LinuxHQ

LinuxHQ is a comprehensive directory where you can find Linux patches, updates, documentation, and other information related to the Linux kernel.

http://www.linuxhq.com

Linux Links

Linux Links is an in-depth, well-organized Linux portal that provides links to many Linux sites and resources. Information is grouped by category and indexed for quick searches. The site also includes news, forums, e-mail, and a Web calendar.

http://www.linuxlinks.com

Linux Online

Linux Online is a clearinghouse of information for almost all things Linux, including news, support, documentation, distributions, user groups, vendors, projects, and online lessons.

http://www.linux.org

LinuxStart.Com

Extensive forums covering a wide range of topics are just one feature of LinuxStart.Com. This site is a human-indexed directory that offers links to a long list of free, commercial, and open source Linux software, plus a free e-mail service, and the latest Linux news.

http://linuxstart.com

Linux Voodoo

Linux Voodoo specializes in hardware, drivers, games, and tutorials. The site has an active community of users and a 24-hour help desk to help you find or use the information available on the site.

http://www.linuxvoodoo.org

LinuxWaves.com

LinuxWaves.com is a portal site for the Linux enthusiast. In addition to discussion forums, the site provides free e-mail, chats, downloads, news, events, auctions, a free newsletter, a beginners' guide, and a bookstore.

http://www.linuxwaves.com

LinuxYes.com

At LinuxYes.com, you can share information, discuss Linux issues, and collaborate on projects. You can also get complete reviews of Linux distributions and open source applications.

http://www.linuxyes.com/en/index.html

■ **Newsgroups & Mailing Lists.** If you need help with a problem, or just want to talk Linux, check out some of the many available mailing lists and newsgroups.

The Linux Resource Exchange

The Linux Resource Exchange offers a searchable database of more than 700 mailing lists and newsgroups; you can also browse an alphabetical list organized by category.

http://www.linuxrx.com

NoDevice.com

NoDevice.com offers fast searching and browsing of programming and Linux newsgroups, as well as links to man pages, FAQs, and tutorials.

http://nodevice.com

■ **News & Media.** Linux news sites range from up-to-the-minute headlines to leisurely, in-depth reviews and features. Get your Linux news fix here.

32BitsOnline

One of the larger Linux Web magazines, 32BitsOnline provides software and hardware reviews, technical articles, news, and feature stories. Many of the news features, editorials, and stories allow user comments, so don't be afraid to speak your mind on topics that interest you.

http://www.32bitsonline.com

Linux.box News

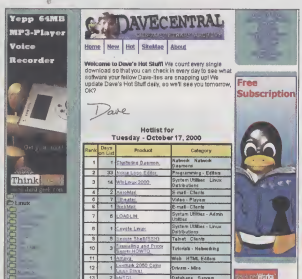
Linux.box News is a well-organized guide to Linux applications, news, and information. You can browse applications by category or use the Linux application finder to search for an application by name.

http://linux.box.sk

LinuxInsider.com

If a whole day is too long to wait for Linux news, how about a news service that's updated every five minutes? Although Linux news doesn't happen quite that often, if something newsworthy does occur, you will probably find it first on this site.

http://www.linuxinsider.com



Check out DaveCentral for the latest software downloads.

Linux NetMag

Each issue of this monthly Web publication contains information about Linux gaming, hardware, news, and applications, as well as interesting Linux tips and tricks.

http://www.linuxnetmag.com

LinuxNews.com

LinuxNews.com publishes daily news, features, and articles, covering both Linux and the open source communities.

http://www.LinuxNews.com

Linux Orbit

Linux Orbit concentrates on news and articles related to the desktop use of Linux, with helpful information about windowing systems, desktop applications, and office suites.

http://www.linuxorbit.com

NewsTrolls

NewsTrolls repositions articles from many online news sources and gathers them under one roof, with an emphasis on the free market and free speech. NewsTrolls also contains original articles and provides a large forum for discussing the news and presenting your opinions. UserTrolls can post their own links to news stories.

http://www.newstrolls.com.

Slashdot

While not strictly focused on Linux, Slashdot includes a large Linux community. In addition

to news and articles, you can also find book reviews, links to external sites, and outspoken opinions on just about any subject dealing with technology. Slashdot forums are renowned for biting opinions, with little held back.

http://slashdot.org

■ **New Users.** The Linux community is happy to welcome new users to the Linux fold. They've provided plenty of resources for you to turn to when you need manuals, guides, answers to FAQs, or other documentation.

Beginners Linux Guide

One of the first hurdles for Linux beginners is installing the beast. The Beginners Linux Guide can give you a hand, answering your questions about installation, partitioning, making boot floppies, configuring your hardware, and much more, all in plain English.

http://www.linux.ie/beginners-linux-guide

learnlots.com

With more than 40 tutorials, learnlots.com covers the most important aspects of learning to use Linux, from installing specific distributions to security issues to using Star Office.

http://www.learnlots.com/linux.cfm

LinuxForKids

LinuxForKids wants to use Linux as an educational platform for kids. It provides links for downloading educational software and games for kids, and software is categorized for easy browsing and reviewed and recommended for appropriateness for children under 10.

http://www.linuxforkids.com

Linuxnewbie.org

Full of articles, tips, product reviews, and news, Linuxnewbie.org is one of the easiest sites around for new Linux users. You will also find an extensive forum where you can ask questions and get answers from friendly folks who want to help.

http://www.linuxnewbie.org

■ **Reference.** Need in-depth help or a specific piece of information? Try the sites below.

HOWTO-INDEX

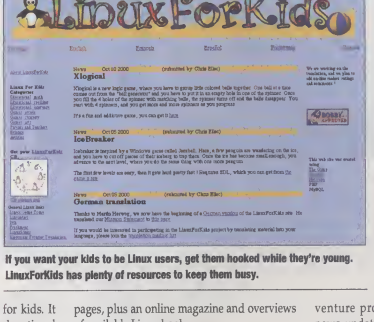
The Linux Documentation Project maintains a formidable collection of how-tos developed for and about Linux. If you need to know how to do something under Linux, chances are you'll find the answer here. Most of the how-tos are technically oriented, but since they're well written, many are useful even for beginners.

http://www.linuxdoc.org/HOWTO/HOWTO-INDEX.html

Linux Documentation Project

The Linux Documentation Project is a collection of Linux tutorials, guides, FAQs, and man pages, plus an online magazine and overviews of available Linux books.

http://www.linuxdoc.org



If you want your kids to be Linux users, get them hooked while they're young. LinuxForKids has plenty of resources to keep them busy.

Linux FAQ

A comprehensive collection of Linux FAQs.

http://www.faqs.org/faqs/linux

Linux Guide

The Linux Guide has a glossary of more than 800 Linux-related terms and definitions.

http://www.firstlinux.com/guide

LinuxGuruz

If you're looking for information about programming, Web servers, computer hardware, or any subject that involves the use of Linux, you will probably find it in this collection of articles, tutorials, and FAQs.

http://www.linuxguruz.org

Linux Knowledge Base

You can find technical information for solving Linux problems here. The Linux Knowledge Base is designed for experienced users, but some of the information is helpful for all levels of experience.

http://linuxkb.cheek.com

■ **Security.** Security is a concern for all computer users, and Linux users can turn to these sites with questions or concerns about the security of their system.

CERT Coordination Center

This site is a security incident reporting service. If you come across a security issue, or you're wondering about a security problem you've heard about, you can check on it here.

http://www.cert.org

Linux Firewall Project

Here you'll find a list of available firewall and general security tools, services, and sites. Planned features for the site include a community message board for sharing information, a newsletter, a mailing list, and downloads.

http://www.linuxfirewall.org

SANS Institute

The SANS (System Administration, Networking, and Security) Institute is a cooperative venture providing system security alerts, news updates, special research projects, and in-depth education on security and networking problems.

http://www.sans.org

■ **A Helpful Community.** Linux users are always happy to see another computer user join their ranks, and many people have made an effort to provide online resources that will help you get started. Even experienced users have questions, and these resources will come in handy for them, too. GS

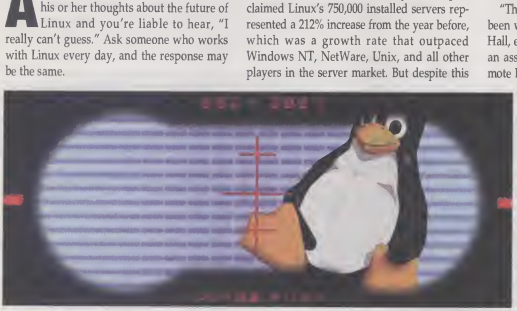
by Tom Nelson and Mary O'Connor

(NOTE: Log on to http://www.smartcomputing.com/pctjan2001/OnlineResources for more helpful Linux sites.)

The Future Of Linux

Three Markets Hold The Key To Tomorrow

Ask someone in the PC industry to offer his or her thoughts about the future of Linux and you're liable to hear, "I really can't guess." Ask someone who works with Linux every day, and the response may be the same.



Linux has garnered a tremendous amount of press in the past year or so. Analysts, programmers, and Linux advocates are discussing its possible future as the OS (operating system) of choice for **embedded systems** (computerized products that are as diverse as traffic lights, photocopiers, medical equipment, and PDAs [personal digital assistants]); as the de facto standard for Web-server operating systems; even as a replacement for Windows. However, no one seems quite sure exactly where it will head next or how fast it will get there.

■ **Global Attention.** Linux's growth in the decade since Finnish college student Linus Torvalds created it is well-documented because major technology research firms, such as IDC and GartnerGroup, periodically release Linux reports. Most have revealed what the Linux community already knew—this free, upstart OS has been growing in popularity like grass after a summer rainstorm.

From its initial release, the Linux user base has exploded. According to Linux developer Red Hat, in 1993, 100,000 people used Linux; in 1995, 1.5 million; and in 1998, 12 million. Two years ago, IDC reported the Linux's user market share had leapt from 6.8% in 1996 to 17.2% in 1998. At the end of that year, IDC proclaimed Linux's 750,000 installed servers represented a 212% increase from the year before, which was a growth rate that outpaced Windows NT, NetWare, Unix, and all other players in the server market. But despite this spectacular growth, Linux remained a player primarily in the medium-to-large server market (corporate, educational, and Internet servers) and was pretty much ignored by individual PC users.

That changed in 1999, when Linux hit 15 million users and such major computer manufacturers as Dell, IBM, Compaq, Hewlett-Packard, and Gateway announced they would offer Linux on their servers, and in some cases, on workstations and portable computers. By that time, several developers had released Linux distributions with a graphical interface, or shell, and companies such as Corel had announced the porting of PC applications for use on Linux. Suddenly, desktop PC users were looking at the OS as a viable alternative.

At about the same time, Linux developers began embedding Linux for use in the "behind-the-scenes" processors that are found in equipment ranging from heating-system thermostats to cellular phones and PDAs. Because it combined low cost, open source, and state-of-the-art functionality, Linux was well-positioned to be a major player in the rapidly developing embedded systems market.

■ **An Eye On Tomorrow.** A year later, Linux continues to make serious waves; one prime example is the fact CompUSA has begun carrying Red Hat's latest desktop OS release, Red Hat Linux 7, in its stores. Linux's major function is still as a server OS, but its potential role in other computing technologies is generating a great deal of interest and contention.

"The hue and cry [of Linux proponents] has been world domination," says Jon "Maddog" Hall, executive director of Linux International, an association of companies that try to promote Linux. "But when you really press them on it, the people [who] are writing Linux would like to see it achieve 30% to 40% of the [total worldwide] operating system share."

Hall's figure reflects all systems, not just those in large corporations, where Linux already enjoys a 34% penetration (an increase of 95% during the last six months of 1999), according to information published by Red Hat. Hall, who is one of the product's most staunch boosters, says, "Linux spans all the major marketplaces," and asserts it stands a good chance of gaining broad acceptance. In order to do that, however, Linux and its developers will have to sustain a three-pronged assault and get the OS on embedded systems, desktop environments (workstations and personal computers), and servers.

Embedded systems. "We're not advocating Linux for the smallest of systems where you are counting every byte," Hall says, "but except for the very smallest of components, Linux is going every place." Hall's "smallest" is extremely small; he says a complete multitasking, networked Linux operating environment can be run in a system the size of a standard PC memory card. Embedded Linux developer Lineo's flagship product, Embedix, runs a system with only 2MB of ROM and 4MB of RAM.

These embedded systems represent one of Linux' major opportunities. Companies such as Motorola, IBM, and Intel are betting on its potential in this area; they and other companies are behind The Embedded Linux Consortium, a group of more than 100 corporations that formed this year to promote Linux as a top embedded OS.

Lisa Sullivan, vice president of corporate marketing with Red Hat, sees the market as a prime opportunity for Linux. "In the last

eight months we have gotten into that space," she says. "As more customers want to connect to the Internet through gadgets, [such as] set-top boxes [and] PDAs, you will see Red Hat partnering with embedded device manufacturers."

Many industry analysts agree with Hall and Sullivan about the potential of Linux in this area. GartnerGroup research director of Unix and midrange strategies, George Weiss, recently predicted that by 2005, Linux will gain the lion's share of the embedded systems market. This prediction is significant because some industry experts are predicting embedded devices will largely replace desktop computers during the next decade.

Desktop environments. Workstations, which are the user end of server-driven computing environments, and personal computers represent a sizeable chunk of the computing market that many Linux developers would like to capture. However, because Microsoft dominates this market with Windows, the potential of Linux is very much in question, and there is little agreement about its future here.

Hall says Linux is beginning to gain momentum in the desktop realm, but Erik Troan, vice president of product engineering for Red Hat, disagrees. "The growth of Linux will be primarily as a server-side operating system. The focus will be people who are running servers," Troan says.

Analysts generally support Troan's view, but they do say Linux will grow in the desktop market. For example, IDC predicted in July 2000 that Linux would surpass the Macintosh OS for client (workstation) environments by the end of 2004, but that it would still lag far behind Windows, which held an 87.5% share at the end of 1999 and is expected to continue to dominate in similar fashion.

Despite this prediction, major corporations are beginning to support Linux for the desktop. Dell presently offers Red Hat's Linux distribution for selected configurations of its workstations and desktop PCs, and IBM announced in June 2000 that it would begin preloading the OS on its ThinkPad notebook computers.

Whether Linux gains widespread acceptance for desktops may depend less upon the major hardware manufacturers than on the software vendors and their users. Right now, few major consumer software companies offer Linux applications, and some peripherals, such as scanners and digital cameras, are not supported with Linux drivers. This shortfall has a dampening effect on the desktop market because users hesitate to purchase an OS that isn't supported by software. By the same token, software companies hesitate to develop software for an OS that isn't supported by users.

One company, Chillware, may make a dent in this iron curtain. The company recently announced it will develop more than 500 desktop applications, including a contact manager, a desktop publishing program, and a full office productivity suite, specifically to run on Linux.

Jay Thorne, Linux user and manager of systems and technology for UserFriendly Media, thinks Linux has a future on the desktop for one compelling reason: price. "The price/performance of Linux is steadily heading upwards, while at best, Microsoft's desktop offering is flat-lining. It will be perfectly viable in eight months, with the anticipated improvements to the client software.

"I can deploy a fairly usable [Linux] workstation with a spreadsheet, a word processor, and an e-mail client for around $500. With Windows and equivalent software on the same hardware, my costs are $750. [That] 50% additional costs really add up when you are buying 500 workstations."

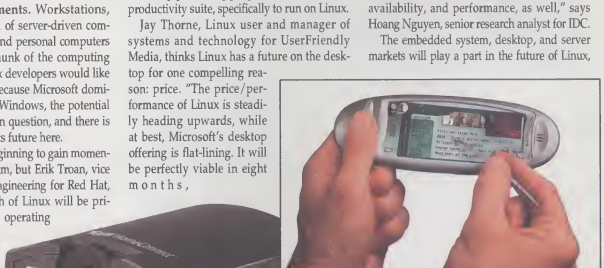
Servers. Servers, especially Web servers, are presently the bread and butter of Linux developers. According to British Internet consultancy Netcraft, Linux is the OS used on 33% of public Web servers—more than any other OS. However, in recent years, Linux has moved well beyond just the Web server market. IDC reported it was the fastest-growing server-operating environment in both 1998 and 1999; Linux server shipments increased 166% in the fourth quarter of 1999 compared to the same quarter of 1998.

Both IDC and GartnerGroup expect this trend to continue and expect the product's base to expand from high-end Web servers into the small and mid-ranged server markets. "Even though Linux represents a small portion of the entry server market in unit shipments, it will become an important area of growth as more branded vendors come out with Linux server offerings and end users select Linux servers not just because of price, but because of reliability, availability, and performance, as well," says Hoang Nguyen, senior research analyst for IDC.

The embedded system, desktop, and server markets will play a part in the future of Linux, but no one seems to know how much. The answer, at least for now, seems to depend on whom you speak with. "I don't think 'Maddog's' goal is unrealistic," Troan says of the 30%-40% total OS goal. "There are very compelling reasons to use Linux, but it's not going to happen overnight."

Thomas Phipps, a computer consultant from Las Vegas who uses both Windows and Linux, says: "The future of Linux is as it always has been . . . growing stronger in the workforce and developing on the desktop. There's almost no way to turn but up." GS

by Jennifer Farwell



Even though Linux is making strides in the server market, many analysts think its greatest potential lies in the embedded systems industry for devices such as digital cameras and smart phones.

Tips For Effectively Searching The Web

Information is a powerful thing. If you are an informed car buyer, you can avoid the pitfalls of buying a car from a sneaky salesperson. And if you know a little bit about a company before an interview, you have a better chance of landing that job. We all want to be informed, and this desire for more information is one of the reasons the World Wide Web is so successful. Never before have so many people had access to so much information. Once you're online, all you have to do is find it.

That's the problem, thought, isn't it? We all crave more information, but every time another sock is piled onto the laundry heap of the Internet, it becomes harder to find the other clothes in the basket. Of course, the information on the Web isn't nearly as disorganized as your laundry, but it may feel that way sometimes. This section will help you sort through all the Web has to offer by explaining how search engines work, discussing specialized search engines, and giving search tips for specific search engines.

103 A Method To The Madness: Understanding The Web's Organization Makes It Easier To Find What You Want
108 Searching The Web With The Top Four Browsers: Tips For Getting The Most From Each Search
111 The Main Search Engines: All The Portals That You Can't Leave Behind
114 Specialized Search Engines: Delve Deeper Into The Web
118 Souped-Up Searches: Find What You Need Faster
122 Yahoo!: Use This Web Directory To Energize Your Search
123 MSN Search: Microsoft's Engines Drive A Powerful Search Tool
124 Netscape Search: Navigate Your Way Through The Web
125 Excite: Lively Results From An Old Pro
126 AltaVista: Put This Engine To Work For You
127 Raging Search: This Search Engine Is All The Rage
127 Ask Jeeves: Straight From The Butler To You
128 Google: You'll Go Gaga Over This Engine's Speed
129 America Online: A Wealth Of Information For Nonmembers, Too
130 Web-Search Software: Powerful Programs Simplify The Information Hunt
132 Get Your Site Noticed: Let Search Engines & Web Directories Help Surfers Find You
134 Create A Higher Profile: Boost Your Site's Place In Search Engine Rankings
136 Learn To Use Meta Tags On Your Site: Give Search Engines Something To Look For
138 Build A Search Function Into Your Web Site: Help Users Find What They Want So They'll Come Back For More

A Method To The Madness

Understanding The Web's Organization Makes It Easier To Find What You Want

In theory, it's easy to create a model of information on the Internet. Just imagine going into your local library, tossing everything into a huge pile, and then loading it all back on the shelves in random order so that "The Cat in the Hat" is wedged somewhere between Roget's Thesaurus and the soundtrack from "My Fair Lady." Now imagine that truckloads of new books, CDs, and tapes are delivered every day and you continue to file them away just as haphazardly. That pretty well approximates the Internet's organizational scheme.

Of course, on the Internet, information isn't kept on shelves; it's stored on the disk space of countless computers, all hooked up in no particular order and each holding files of heaven-only-knows what. How in the world, then, can anybody know what's available and how to find it?

Such was the situation in the early days of the Internet. At that time, there was no such thing as the World Wide Web. Information was generally shuttled from one computer to the next through a system known as FTP, or File Transfer Protocol. You can picture the FTP server system as a text-based ancestor of the Web. If George had a library of cool games, research papers, and scripts to old vaudeville routines he wanted to share, he'd put them on an FTP server attached to the Internet. Then if Gracie wanted to access some of his information, she'd fire up her FTP client program, enter George's FTP address, and find a list of the available files, much like the list of files you see if you look through your computer's directory in Windows Explorer. She could then download copies to her own computer.

The problem with this system was that Gracie had to know that the files existed and that George's FTP server was the place to get them. This means she had to have either discovered those files earlier by accident or somebody had to tell her where they were. Even when the entire Internet was only a few hundred computers large, this made for a mess.

Archie Saves The Day. Things started to change in 1990 when Alan Emtage, Bill Heelan, and Peter Deutsch, all students at McGill University in Montreal, created a program originally called Archives. The Archives program would call up FTP sites around the Internet and automatically download a list of all the files available. The lists were then stored in a database. Then, if you were looking for a file, you could log on to the database and discover what FTP servers had it for download. Internet search was born.

These days, you won't hear anybody refer to the Archives program, but not merely because it's outdated. Rather, the name was too long for the computer system it ran on, so the name was shortened to Archie. Two other programs with slightly different capabilities soon followed, originated by programmers who couldn't resist naming them Veronica and Jughead.

As innovative and sanity-saving as Archie and its cousins were, they had severe limitations. For one thing, they could locate all known servers, but if somebody put up a brand-new FTP server, Archie wouldn't have any way of finding it on its own.

Spiders Enter The Web. Enter another student, Matthew Gray, from MIT. In 1993, he came up with a program known as the World Wide Web Wanderer that was designed to measure the growth of the Web. The Wanderer was capable of discovering *new* sites by automatically following links from one site to another, cataloging the different ones it found. At first, its mission was merely to note the number of Web servers functioning, but soon it was reprogrammed to collect the various **URL**s (**u**niversal **r**esource **l**ocators; Web page addresses) it discovered. This collection of URLs became the first index of the Web, known as Wandex.

The World Wide Web Wanderer was a new type of program, a Web robot, or bot, for short. It functioned autonomously, not merely going to a preprogrammed list of sites and downloading information but actually seeking out new places to visit. This type of Web-exploring robot became known as a spider for the way it crawled across the Web.

It's interesting to note that in these early days, online spiders were often as unwelcome on many Web sites as actual eight-legged spiders

are in many bathrooms. Picture what was happening: Lots of software programs were zipping across the Internet, following every link they found. People accessed popular sites hundreds of times every day, so spider activity put a big strain on system resources, causing many systems, sometimes even the entire Internet, to run significantly slower. As the software became more sophisticated and Internet resources grew, the problem diminished, but not before creating quite a little storm of anti-spider sentiment.

From World Wide Web Wanderer on, however, the development of search engines was, in large part, parallel to the development of spiders. You'll find this fact reflected even in company names. One of the most popular search engines, Lycos, which was launched in 1994, was named after the wolf spider, whose scientific name is lycosidae lycosa. Inktomi, the search engine that initially powered HotBot in 1996 and now provides the search muscle behind several sites, was named after a spider from Native American mythology.

Several spider programs were written and released onto the Web, each reflecting the ambitions of its creators. Some did little more than collect the URLs and titles of pages. Others collected keyword information from the headers of each page. Some went so far as to save the first quantity of each Web page's text. And when AltaVista burst out with an immensely powerful engine running on several huge NEC computers with the goal of cataloging every single word on every page of the Web, the online world buzzed with excitement. The idea of being able to find every reference to the most obscure term, even when buried at the bottom of a Web page, sounded to many like a dream come true. Of course, there was a downside.

■ **The Needle In The Well-Organized Hay Bale.** So far, we've discussed only how a search engine collects data. As critical as this is, though, it's only the beginning of the search engine process. No matter how much information is in a database, it's worthless if users can't log on and get the information out in a useful manner. And naturally, the bigger the database, the greater the challenge.

Let's imagine, for example, that you want to find information on Beagles. Type **beagle** in a major search engine, and you can easily find well over 100,000 Web sites containing that word. Even when you refine your search to eliminate references to the HMS Beagle, writer Peter Beagle, and stuffed beagle toys (more on that procedure in a minute), you still have a list thousands of sites long. What an exercise in frustration it can be if your visits to the first 30 or 40 sites listed turn up nothing more relevant than such phrases as "Click here for a picture of our daughter with our pet beagle." The information you're looking for might be languishing on a terrific Web site that for some reason the search engine placed in position 839 in the results list.

Indexing and sorting. Part of that problem is solved in advance by a search engine's indexing and sorting software. A search engine's software indexes and sorts the raw page content sent back by the spider. In this process, the software notes and files in a database the words on each Web page. But it doesn't weigh all words equally. Some words are recognized as being more important than others.

Some words are noted as keywords in a Web page's meta tags. This is a list of words at the top of an HTML (Hypertext Markup Language) file marked by the site's creator to let search engines know these words are important. Meta tags are not normally visible when you pull up a Web page with your browser, although you can set your browser to see the mark-up code if you wish. Spiders, however, have no trouble finding them. Most are programmed to seek them out. (Read more about meta tags in the "Learn To Use Meta Tags On Your Site: Give Search Engines Something To Look For" article on page 136 of this issue.)

Spamdexing. Unfortunately, some search engines now ignore or downplay keywords in meta tags because some unethical Web site operators have abused them. Imagine finding what looks like a highly rated site about beagles in your search results list, but when you go there, the site has nothing specifically about beagles at all. Instead, you find a large, obnoxious advertisement telling you why you should always feed your dog Hodgekins Mostly Cooked Doggie Treats.

Upon checking the meta tags for the site, you see that the word beagle is listed there, along with the name of every other major breed, plus the terms dog, canine, pet, watchdog, Lassie and Rin-Tin-Tin. Also, much to your surprise, many unrelated terms such as sex, money, Britney Spears, movies, and music appear. The latter unrelated terms are in there because they're popular search terms, and the site's Web master is trying to misdirect people to his site to read his pitch. This sort of chicanery is known as spamdexing.

Other search considerations. Whether a search engine uses meta tags in rating and sorting sites, there are several other factors that search engine software must take into account when returning search results.

How Many Pages Does One Engine Index?

It's virtually impossible to get an accurate count of how big the Web has become and how much of it has been charted, but this gives you a good idea of the scope of several major search engines.

Keep in mind that bigger indexes are not necessarily better. While a larger search engine database may indeed contain more useful information, especially about arcane topics, it may also indicate a huge repository of repetitive or useless sites. Some search engines and directories are favored precisely because they keep their databases smaller and limited to the most useful sites.

The number of million pages indexed is based on numbers reported by the search engines between July and October 2000 and gathered by Search Engine Watch. The percentages are based on an estimate of 1 billion Web pages from a joint Inktomi and NEC Research Institute report issued in February 2000.

Search Engine	Number Of Pages Indexed	Estimation Of Indexable Web Pages Indexed
AltaVista	350 million	35%
Excite	250 million	25%
Fast	340 million	34%
Go.com	50 million	5%
Google	560 million	56%
Inktomi	500 million	50%
Northern Light	265 million	27%
WebTop	500 million	50%

The search engine software may also look for words that occur in the URL itself and in the page title. The software usually considers these words important to the site. It may also weigh certain words more heavily depending on such factors as where they fall within the text, whether they're capitalized or in all capital letters, and if they're coded to display in large type. Frequency is another point that search engine software considers, on the assumption that a page using the word beagle several times is more likely to have a wealth of relevant information about that subject than a site that uses the word only once.

Yet, search software can miss indicators of importance. If you were to view a Web site and see the words All About Beagles in huge, fancy letters, you'd have no trouble seeing it or knowing exactly what it meant. But if those words are a graphic, rather than coded text, they won't appear in the search engine's index at all. Spiders read text, but they cannot see graphics.

Top placement goes to the highest bidder? Each search engine weighs each of these elements differently. While some search engine companies will tell you which factors it takes into consideration, the exact formulas it uses are closely guarded secrets. Periodically, though, rumors circulate that suggest that some search engines accept payment to place certain sites at the top of their results list.

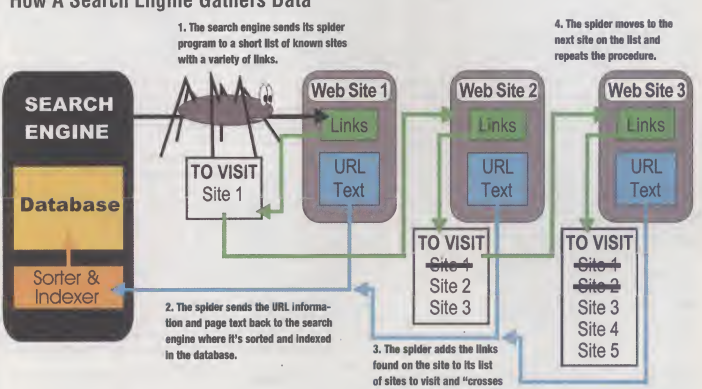
Like many rumors, this one is based on a grain of truth, but just a grain. GoTo.com does accept payment for positioning sites at the top of its results list, and those listings are clearly marked. AskJeeves also provides some special exposure to advertisers. But there's no evidence that any major search engines are secretly sliding sites into top position in return for payment. AltaVista did experiment with paid placement in 1999, but despite the fact that it clearly identified the paid listings, user reaction was so negative that the engine soon dropped the practice.

■ **The Searcher Takes Control.** Smarter sorting and indexing software have made it less likely for the best matches of a user's search to end up at the bottom of a results list, but with the Web exploding in size, and search engine software indexing hundreds of thousands of pages, a searcher needed a better way to control her search. Who has time to even glance through a listing of ten thousand options?

Boolean operators. Searchers can narrow the field and find just what they want by using Boolean operators. These operators are simply the words AND, OR, and NOT, which better restrict a search. For example, entering a search for beagle AND food would return only pages that contain both the word beagle and food, while entering beagle OR food would return all the pages with the word beagle plus all the pages with the term food. Entering beagle NOT food would give you all the pages with the word beagle except for those that also contain the word food. These operators can be strung together in many ways. Enter beagle AND food NOT hodgekins to get all the pages that contain both the words beagle and food except for those containing the word hodgekins.

Quotation marks. Another way to narrow the search field is to use quotation marks; they can be an important part of a search. In many search engines, everything entered between quotation marks is treated as a single word. For example, let's assume you run two searches in a search engine. For the first, you enter beagle food, and for the second, you enter "beagle food."

How A Search Engine Gathers Data


1. The search engine sends its spider program to a short list of known sites with a variety of links.
4. The spider moves to the next site on the list and repeats the procedure.
SEARCH ENGINE
Database
Sorter & Indexer
TO VISIT
Site 1
Web Site 1
Links
URL Text
Web Site 2
Links
URL Text
Web Site 3
Links
URL Text
TO VISIT
~~Site 1~~
Site 2
Site 3
TO VISIT
~~Site 1~~
~~Site 2~~
Site 3
Site 4
Site 5
2. The spider sends the URL information and page text back to the search engine where it's sorted and indexed in the database.
3. The spider adds the links found on the site to its list of sites to visit and "crosses off" the name of the site just visited.

What you get in the first case will depend upon the search engine you use. Because you didn't indicate AND or OR, most engines will assume one or the other. AltaVista and Go.com, among others, will assume you mean OR, and will give you all the pages with either of those words. FAST Search, on the other hand, will assume you mean AND and will give you only those pages containing both words. In the second case, using the quotation marks, you'll get only those pages that contain the two words side by side, just as you typed them.

Proximity searching. Some search engines take the matter further still, allowing what's known as proximity searching. These include use of operators such as NEAR or ADJ (short for adjacent). Beagle NEAR food would give you the pages that not only contain both words, but also have them close to each other—usually within about 10 words. Similarly, beagle ADJ food would require that the two words be side by side.

Upper or lower? Capitalization often has a role to play, as well. In most cases, entering an uppercase character specifies that you're looking for pages that use uppercase, while lowercase is not specific. In other words, entering Beagle will yield only the pages that have the word beagle capitalized, while entering beagle will give you all pages that feature the word, whether capitalized or not.

Ask a question, any question. The last search specification we'll mention is probably the easiest. Some search engines let you enter a question in the search box instead of a complicated string of operators and quotation marks. This natural language query lets you type in "what is the area of a circle?" for example, and find all relevant information without having to sort through pages that include every separate word of the question. AltaVista and AskJeeves are two engines that offer this capability, although AskJeeves promotes plain language questions as its primary means of accessing information.

Common Search Terms

Boolean search—A search for documents that contain or exclude certain words or phrases specified using operators such as AND, OR, and NOT.

bot—Short for robot, a software program that automatically performs tasks, such as searches, for a user.

concept search—A search for documents related to the idea behind a word rather than for the word itself.

find similar—An instruction to a search engine to find additional documents similar to a specified one.

hit—A document found by a search.

meta tag—A form of HTML that gives information about a Web page.

Spamdexing—The practice of filling meta tags with misleading key words in order to make a document turn up in a search where it normally would not appear, or to make it appear with an inflated ranking. Web site creators will do this to attract attention to their site.

spider—A software robot that searches the Web and sends information about pages found back to a search engine.

Finding A Web Site

Some people scour the Web for new and interesting sites through search engines. Others venture to a new site by clicking a link in the signature of an e-mail. These study results show a breakdown of how people find Web sites.

- Search engines: 85%
- Follow links: 88%
- Friends: 65%
- Magazines/newspapers: 63%
- Internet directories: 58%
- Signatures in e-mail messages: 36%
- TV: 32%
- Usenet newsgroups: 30%
- Books: 28%
- Other: 29%

Source: Taken from studies by Georgia Institute of Technology's Graphic, Visualization & Usability Center as reported by Search Engine Watch.

■ **Search Engines That Aren't.** Many of us had our earliest online search experience with Yahoo!, which is still very much a major player in the search engine field. Unlike the other sites mentioned so far, however, Yahoo! does not use spiders. That's because it is not, in the strict sense of the word, a search engine; it is a search directory.

Yahoo! is compiled not by programs but by people. It began as a list of its creators' favorite sites and grew into the enormous directory it is today. For a long time, each site listed was found and indexed in a subcategory by a human being. Yahoo! staff also accepts submissions of a site. These submissions are examined and, if accepted, assigned to a niche in the index.

Of course, Yahoo! does offer search functions. You can enter the word beagle and get a list of sites just as you would with AltaVista or Lycos or FAST Search. But Yahoo! was designed to operate through layers of categories, which can often be more efficient than the use of a search engine.

Let's say you are looking for the Web site of the U.S. patent office. You could, of course, enter "U.S. Patent Office" in your search engine of choice, but you might find a hundred Web sites that merely refer to the office before you find the site of the office itself. In a directory, you simply pick a major category and keep drilling down through the subcategories to find what you want. In this case you'd start with Government and select U.S. Government followed by Executive Branch, Departments And Agencies, and Department Of Commerce to find United States Patent And Trademark Office.

These days, there is some blurring of the distinction between pure search engines and directories. Many search engines offer directory-like features, while directories offer search engine-like user interfaces. Even Yahoo! is supplemented by the Google search engine.

■ **Millions Of Searches Served Every Day.** It's hard to say exactly how many searches an engine performs on a daily basis, but here are some numbers compiled by Search Engine Watch (http://www.searchenginewatch.com), an online site that keeps track of search engine news and activity. AltaVista sees 50 million searches each day, Inktomi gets 47 million searches each day, Google performs 40 million a day, GoTo performs 5 million a day, and AskJeeves performs 4 million every day.

That's a lot of searching, which means there is plenty for you to find, so what are you waiting for? 65

by Steve A. Glaser & Elizabeth Lewis

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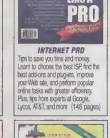

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Search The Web With The Top Four Browsers

Tips For Getting The Most From Each Search

Searching for information is one of the main reasons people go online, so it's no surprise that the main Internet browsers: Microsoft Internet Explorer 5.5, Netscape Navigator 4.08, NeoPlanet 5.2, and Opera 4.02, are equipped with search functions. Each of these Web browsers uses slightly customized versions of popular search engines (such as Lycos and InfoSeek) and has different methods for finding what you're looking for. We'll walk you through the basics of searching with each one.

■ **Microsoft Internet Explorer 5.5.** One way to begin your search with Microsoft Internet Explorer 5.5 (IE) is to click the Search button on the Standard Buttons Toolbar. This will open a Search pane on the left half of your screen. From the Search pane, you can choose to search in a specific category. For example, if you're looking for a business, click the Find A Business radio button, and if you're trying to find a Web page, click the Find A Web Page radio button.

Alternately, use the Find A Web Page Containing search box to search for Web pages that contain a specific word. If the results of this search aren't successful, you can try an advanced search by clicking the Use Advanced Search button. An advanced search lets you specify such things as the language of the Web page, when it was last modified, and if it should contain images, video, audio, or MP3 audio.

Choose a search engine. IE makes nine search engines available (MSN Search, GoTo.com, AltaVista, Lycos, GO.com, Excite, Euroseek, Yahoo!, and Northern Light) to help you find what you're looking for. If you don't like the results of a search performed by one engine, click the Next button at the top of the Search pane to see the results the next search engine returns. You can also click the Down arrow beside the Next button to skip to a specific search engine.

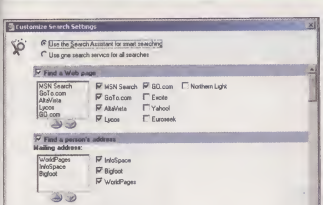
Click the Customize button to open the Customize Search Settings dialog box, which will further help you specify which search engines you want to use. For example, if you are looking for a Web page and you want to search the resources of all nine engines, make sure the boxes in front of all the engines in the Find a Web Page section are checked.

IE uses other resources besides search engines. In the Customize Search Settings dialog box, for example, you can search for the meaning of a word using either Merriam-Webster or Dictionary.com or both. This dialog box also keeps a record of the last 10 searches you performed so you can access them again quickly.

Search from the Address Bar. If you don't want to hassle with the Search pane, use IE's address bar to perform an Autosearch. The address bar is where you type the URL (universal resource locator; Web address) of a Web page. To search from the address bar, click once anywhere in the address bar. This should highlight all of the text there. Next, type **?**, **go**, or **find**, (these words aren't necessary, though) followed by a space and the word or phrase you want to search for. IE will use the default search engine (which you can change) to show a list of links in the Search pane on the left side and a possible matching Web page in the pane on the right.

To customize an IE Autosearch, choose Internet Options from the Tools menu. In the Internet Options dialog box, click the Advanced tab. Scroll down the list of settings until you see Search From The Address Bar. From here, you can disable searching from the address bar. You can also choose to see only resulting links instead of a resulting Web page or, just the opposite, to see just a resulting Web page instead of resulting links.

Finally, if you want to change the default search engine that IE uses for Autosearches, click the Customize button in the Search pane. Then click the Autosearch Settings button in the bottom left corner of the Customize Search Settings dialog box. When the Customize Autosearch Settings dialog box appears, choose the search engine you want to use from the drop-down list. Click OK. You can also make the above changes in this dialog box.



If you want to search the resources of all nine of the engines Internet Explorer uses, make sure the boxes in front of all the engines in the Find a Web Page section are checked.

■ **Netscape Navigator 4.08.** Searching with Netscape Navigator 4.08 is simple. To begin, click the Search button on the toolbar to open the Netscape Search page. Next, click the search engine you want to use (your choices are Netscape, Lycos, HotBot, LookSmart, GoTo.com, AskJeeves, Google, AltaVista, and Excite) and then enter the word or phrase you want to search for. Click Search or press ENTER.

If you want to search by category instead of keyword, you have many options. You can choose Explore By Topic, Find A Person Or Place, or Find Business Information, to name a few. Other links help you quickly find e-cards, shopping, and home and auto information.

Search engine specifics. The Netscape Search page provides one-click access to nine major search engines. Keep in mind, though, that you might consider entering search keywords in a different way depending on which search engine you are using because each search engine may have a different way of interpreting them. For example, if you want to search for the phrase "roses are red," you might enter +roses +are +red in the text box for one search engine and "roses are red" for another. Be sure to click the Search Tips link above the Search button to learn the specifics of each search engine.

Set a default search engine. If you like one search engine better than all the others, you can set it as the default engine that will appear each time you perform a search. Do so by clicking the search engine of your choice from the Netscape Search page and then clicking the Keep (name of search engine) as my search engine checkbox under the Search text box.

Home page search. Perhaps an even simpler way to search with Netscape is to type a keyword into the Search text box on Netscape's home page. By default, Navigator will perform a Netscape search, but you can choose one of the other eight search engines from the drop-down box to the left of the Search text box. From this Search results page, you can also search by such categories as Business, Home & Family, Shopping, and Recreation.

Use Internet keywords and shortcuts. Another easy way to search is to type a keyword such as **pets** directly into Netscape's address bar. Navigator will return possible matching links. You can also type **buy** and the word you want to buy, such as **shoes**, into the address bar and then press ENTER to have Navigator tell you where you can buy shoes.

Netscape has just released its latest browser, Netscape 6. For more information on this new browser, check out our February issue.

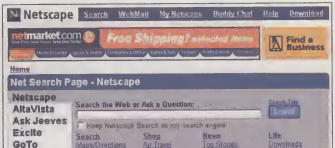
■ **NeoPlanet 5.2.** There are several ways to search with the NeoPlanet browser. One way is to simply enter a keyword or phrase into the search text box on the toolbar and click the magnifying glass icon or press ENTER to begin the search. NeoPlanet will display your results in the browser window. If you want to make this search a little more specific, click the drop-down arrow next to the box on the left of the search text box. The list that appears lets you choose whether to search with the Lycos search engine or the HotBot search engine (more on this later). You can also choose to find games, get quotes, or use mySimon sports, among other things.

To help you quickly relaunch a previous search, NeoPlanet saves the words or phrases you have entered in the search text box. To access them, just click the down arrow next to the text box and select the one you want. If you share a computer with someone else, however, and want to keep what you search for private, you can do so. Just choose Clear Quick Search from the View menu and click Yes in the Confirmation dialog box.

The Search window. Another way to search on NeoPlanet is to open the Search window. Do this by either choosing Search The Internet from the File menu or pressing ALT-S from any screen in NeoPlanet. The Search window will open, and from there you can search the Internet with Lycos or HotBot by entering a keyword or phrase into the appropriate search text box and clicking the Go Get It button. If you prefer, you can bypass the search text box and click a more specialized category button, such as Find Movies, Search USENET, or Go Shopping from the Search bar on the left.

From the Search window, you can also perform an advanced search. Click the Advanced Search button to get started. Enter a word or phrase in the search text box and then use the drop-down boxes above and below to choose how many results NeoPlanet should display (10, 20, 30, or 40) and how it should interpret the search words or phrase (as the exact phrase, in any order, or in no order, for example). Click Go Get It to see the Results tab. If you don't find what you want, click the Search tab to begin again.

This time you may want to specify which language the Web pages NeoPlanet looks for



The Netscape Search page gives you simple access to a number of other popular search engines in addition to Netscape's engine.

should be in (there are 15 to choose from) or set a specific category to look for, such as newsgroups, downloads, or recipes. You can also search a specific Web site from NeoPlanet using the advanced search features. If you think a Web site has the answers you need but you are having trouble finding them, type the URL of the Web site you want to search into the Selected Web Site box in the Search The... section of the Advanced Search page, click the Selected Web site radio button, and press ENTER or click the Go Get It! button.

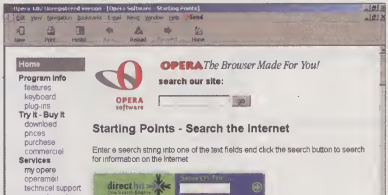
Search and browse from the address bar. Perhaps even easier than pressing ALT-S to open the Search window is typing a word or phrase to search for in NeoPlanet's address bar and pressing ENTER. The browser will first assume that you have entered a valid address for a site you want to visit. Then when NeoPlanet can't find the site, it will launch a search of the Internet and display the first resulting Web page in the browser window.

This feature works basically the same way for Web pages. If, for example, you want to learn more about the Kraft industry but aren't sure of their Web address, just type **kraft** in the address bar. NeoPlanet will find Kraft's Web page for you.

■ **Opera 4.02.** Opera's search features aren't as varied as the features of the other browsers in this article. To begin a search with Opera, you have two choices: choose New Search Window from the Window menu or type a word in the Web Search or Book Search text boxes on the home page.

New Search Window. When you choose New Search Window from the Window menu, you will see a page that automatically gives you two more choices: to search Opera's site or to search the Internet. To search Opera's site, type a word in the search text box and click the Go button or press ENTER. The ensuing results page will show you the pages Opera has that match your keyword or phrase. The sites with the most stars indicate a better match.

Alternately, you can search the Internet. Back on the New Search Window page, you will see search text boxes for about 18 search engines, some of which are German and Scandinavian. Simply choose which search engine you want to use, type in a keyword or phrase, and click the appropriate button or press ENTER.



Opera offers its own search services as well as the services of over 15 search engines, including German and Scandinavian engines.

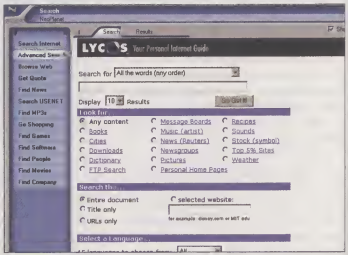
Each search engine has a slightly different method of searching. For example, AltaVista gives you the choice between searching the Web and searching USENET. It also lets you choose which language to search in and includes an Advanced Search button. Google, on the other hand, provides a drop-down list from which you can choose a specific category to search.

Of course, Opera displays the results of this search on the corresponding search engine's site. To get back to the Opera search page, just click the Back button and continue searching with the same search engine or try your luck with a different one.

Web or book search. As we mentioned earlier, the other way to search with Opera is to type a keyword or phrase into either the Web Search or the Book Search text boxes on Opera's home page. For example, if you're looking for the latest book by your favorite author, just type the name of the book in the Book Search text box and click Search or press ENTER. Alternately, click to Current 100 Best Sellers... link just beneath the Book Search text box to see what's hot in the book industry.

For further search options, you can click the More Search Facilities... link below the Web Search text box. This displays a page with 15 categories you can search in. Click the Home link for information on such things as gardening and finding an apartment. The Health link will keep you informed with links to Midwifery, Pharmacy, and Dentistry.

Bookmarked search engines. Finally, you can quickly get to a search engine by clicking the Bookmarks menu, selecting the Search Engines folder, and choosing the engine you want to search with. There are 22 engines in the list by default.



Using the Advanced Search Options in NeoPlanet, you can narrow the parameters of your search. You can search by category, language, and more.

■ **Look Around.** Whether you swear by the search capabilities and features of just one of these browsers or use the features of each browser for different circumstances, it's helpful to know what each has to offer. 65

by Paul Sanna

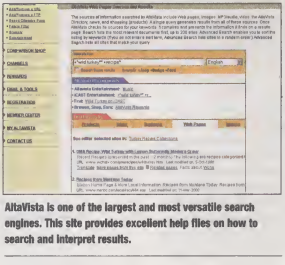
The Main Search Engines

All The Portals That You Can't Leave Behind

You didn't have much of a choice if you wanted to search the Internet in the mid-1990s. There were but a handful of general directories and search engines available. The few individuals who spent much time searching the Net generally knew what the options were and the strengths and weaknesses of each.

An Internet Web search is no longer an arcane research activity but a common daily task for millions of users. The available tools have proliferated as well. Yahoo!'s list of individual search engines now sits at around 160. The list of **metasearch sites** (these are Web sites that automatically run a search through multiple search engines simultaneously) will present you with another hundred-plus alternatives.

Many of these search sites are for specialized use. There are search engines dedicated to shopping, to specific geographic areas, to Star Trek and to philanthropic concerns, but there are dozens of general sites as well. Where, then, does a new searcher begin? Unless your searches are restricted to a specialized area, you cannot go wrong learning the ropes on the top Web search sites. There's no unanimity about which few sites are the best of the best. Among the factors that can be considered are popularity, size of database, search speed, and the variety of features available to help narrow the search. Determining how to weigh those factors is largely a matter of preference.



AltaVista is one of the largest and most versatile search engines. This site provides excellent help files on how to search and interpret results.

Regardless, there are some sites that repeatedly rank among the top choices by a wide variety of sources. Here's a rundown on some of the overall favorites.

■ **AltaVista.** This engine is the one that blew everybody away at launch, and it's still one of the most comprehensive and powerful search engines available. It was the first to index every word on every page it found in an attempt to record the entire Web. No search engine has come close to recording the Web in its entirety, and few sites have been able to develop larger databases. It is for this reason that AltaVista remains a favorite of Web researchers. The search functions are powerful and versatile; they let you search for things such as images, multimedia files, recent news stories, and even sites that have links to a specific URL (universe resource locator). It is even possible to do plain language searches. For example, if you take the time to type in **What is the capital of Ghana?** or **Where can I buy coffee online?**, you will be provided with a list of sites likely to answer your question. Also, If you are using an older computer or have a slow Internet connection, there's a Text Only option that allows you to avoid downloading graphics for greater speed.

http://www.altavista.com

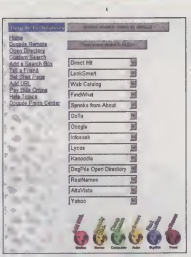
■ **Ask Jeeves** In the strictest sense of the word, Ask Jeeves is not a search engine. It is a directory of information, carefully compiled and cataloged by humans rather than by computers. This is one innovative search site where plain language questions aren't merely possible but are the norm (in fact, Ask Jeeves is the source of AltaVista's plain language option). You type in a question, such as "What is the capital of Ghana?", and if Ask Jeeves doesn't have that very question on file, it will give you a list of similar questions ("Where can I find tourist information for Ghana," "Where can I find extensive historical, economic, and political information about the country Ghana," and so on). You choose the one that seems most similar to yours and Ask Jeeves will give you a selection of hand-picked sites offering the answer. It's great place to send the kids for homework help.

http://www.ask.com

■ **Direct Hit.** Suppose you're looking for something you're pretty sure many others have looked for in the past. Your search turns up thousands of World Wide Web sites, but most of them are not good prospects. You can either keep paging through the list of hits, find more ways to narrow your search,

or turn to Direct Hit. This search engine tracks the searches conducted on several other major search sites, notes the various lists that those searches turn up, and finally notes sites that users actually click. The sites clicked the most are rated highest. The odds are greater that you'll find more worthwhile sites at the top of Direct Hit's list. Direct Hit has been a subsidiary of Ask Jeeves since February 2000.

http://directhit.com



DogPile is a meta-engine that searches up to 14 other Web search engines for you. You can control which ones you want it to explore.

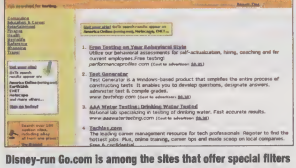
■ **DogPile.** DogPile is one of the most popular metasearch engines. The site searches through a list of up to 14 top search engines and directories. You get your search results grouped according to which engine found them. Of course, that means you may get the same site listed up to 14 times if it was found on all the sources. This could be a benefit (flagging a particularly useful site rated highly by all the search sites) or a disadvantage (filling your list with redundant listings) depending on your point of view. The list of sites searched is customizable. You can change the order in which their results appear or skip certain search sites entirely. DogPile also offers searches for specific types of files, including Web sites about specified geographic locations, business news, auctions, audio/MP3 file and graphic images.

http://www.dogpile.com

■ **Excite.** Since its early days Excite has grown from being a leading search engine to a full-fledged Web portal. The site bustles with easy links to a wide variety of news and information and a customizable home page. The search engine, however, remains at the heart of Excite's popularity. An Advanced Search option makes it easier for users to narrow searches by rating individual keywords as Must Have, Good To Have, or Must Not Have as well as by limiting searches to specific languages, countries, and Internet domains. Special searches are available for photographs (either news photos or photos posted by Excite community members), news stories, and audio/visual files. A category search option allows you to use a directory-style approach. Enter a word specifying a topic or category instead of entering a keyword for the search engine to seek out. Excite will give you a list of sites pertaining to that topic, as selected and categorized by human editors.

http://www.excite.com

■ **FAST Search.** As of October 12, 2000, FAST Search was able to claim being the Web's largest search engine, featuring more than 575 million Web pages recorded in their entirety. The site is also one of the fastest search engines with the average Web search clocking in at just under a half second. It also boasted the record of having its search program explore more than 1.5 billion Web documents. The home page is simple, offering a field to type your search terms in and links to advanced features. FAST Search accepts the range of special characters to tell the engine which words must be found, which must not, which should be treated as a phrase, and more. Extra control is also available by entering your search parameters through the Advanced Search form, where you can specify whether individual search words are to be found in the text, title, link name, or URL itself, as well as whether to limit the search to certain domain names. There is also a control to minimize offensive content.


BY TRAINING
1. Free Testing on Your Achievement Style
2. Test Generator
3. AAA Water Testing - Drinking Water Tested
4. Testing.com

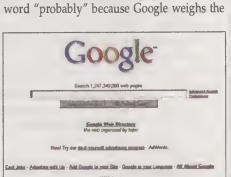
Disney-run Go.com is among the sites that offer special filters to weed out sexual, violent, and hate-oriented material for World Wide Web searches by children.

http://www.alltheweb.com

■ **Go/Infoseek.** Formerly called Infoseek, this site became known as Go.com when it became part of the Walt Disney Internet group. Infoseek still exists, but it's the search engine powering the Go site. One of Go.com's claims to popularity lies in a search formula, known as the ESP search algorithm, which allows it to zero in on meaty sites even from very general searches. Like Excite, Go has grown into a portal, offering access to lots of different Web services including e-mail and a Web space for members. If you'll be searching with young children or will have young children searching on their own, you may appreciate the GOguardian feature, which a parent may activate to filter out adult material. The PowerSearch feature allows easy customization of a search through the use of forms.

http://www.go.com

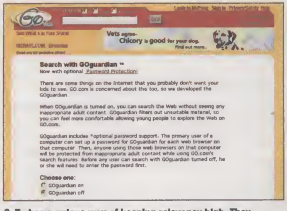
■ **Google** Google bases its page ranking on what it refers to as "the uniquely democratic nature of the Web." It considers each link to a Web page as a recommendation of that page by the linking (search results) page. If there are 500 Web pages dealing with the topic of widgets, and 350 of those provide a link to William's Wonderful World Of Widgets, then Google interprets that as Williams's Wonderful World Of Widgets having 350 votes. If that's more links than any other widget site, it's probably the one that will be ranked number one on the results page. We use the word "probably" because Google weighs the



Google rates sites by how many other sites link to it. The result is that the highest rated sites are the ones that similar sites deem important.

votes: those from a Web site that has 200 other sites linking to it will be considered more important than votes from a site with only three links to it. The end result is that a search performed on Google is very likely to give you excellent results in the first page or two. Clicking on the I Feel Lucky button will send you directly to the World Wide Web site Google has listed as number one.

http://www.google.com


Vets agree-
Chicory is good for your dog.
Find out more.
Search with GOguardian ™
Now with optional Password Protection!
There are some things on the Internet that you probably don't want your kids to see. GO.com is concerned about this too, so we developed the GOguardian.
When GOguardian is turned on, you can search the Web without seeing any inappropriate adult content. GOguardian filters out unsuitable material, so you'll feel more comfortable allowing young people to explore the Web on GO.com.
GOguardian includes *optional password support. The primary user of a computer can set up a password for GOguardian for each web browser on that computer. Then, anyone using those web browsers on that computer will be prompted for the password before adult content while using GO.com's search features. Before any user can search with GOguardian turned off, he or she will need to enter the password first.
Choose one:
GOguardian on
GOguardian off

GoTo has a unique way of keeping relevancy high. They charge companies for listings. The theory is that Web sites that have to pay to be seen will keep themselves out of listings where they're not relevant.

■ **GoTo.com.** This site (which is not related to Go.com in any way) has an unusual claim to fame. GoTo.com sells positions in its main listings; the idea is not merely that this provides the company with income, but also that it improves the relevancy of the listings a search returns. A company is not going to be willing to pay money to put their Web site in front of an uninterested individual. Therefore, only those who feel that they have something of value to you will want to pay the cost of getting into your search results. Additional, non-paid results come from the Inktomi search engine, which powers several Web search sites

http://goto.com

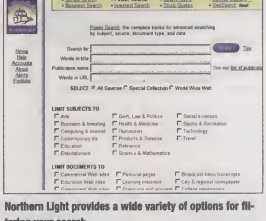
■ **HotBot.** The HotBot Web site began life as a product of Wired Digital, and it still shows in the use of day-glo green. It has since passed into ownership by Lycos. Most initial hits come from the Direct Hit service with additional listings provided by Inktomi. What makes HotBot stand out are its many search options. Aside from the usual set of word filters, sites can be screened by date, domain, and whether they include such elements as Java, Shockwave, MP3 files, Adobe Acrobat, or several others. You can opt to search only the top page of a Web site or search the site to whatever depth you desire. HotBot also allows for what they call "Word Stemming," which includes grammatical variations on your search terms. If you search for the word "liquid," it would also look for variations like "liquify."

http://hotbot.lycos.com

■ **LookSmart.** This is worth checking out if you're looking for a few good sites and don't want to risk being overwhelmed. It's a small directory with only about two million sites indexed. You can ask a question on LookSmart Live if you have trouble finding what you're looking for; LookSmart's online community is where real live people help provide answers to each others questions.

http://looksmart.com

■ **Lycos.** Lycos was one of the early leaders of Web search technology. The site changed over to a Yahoo!-like directory structure in mid-1999 with additional content coming from the Open Directory project, HotBot, and the FAST Search Web site. Lycos has remained one of the most popular search sites due to its powerful search functions and presentation of search results.



Northern Light provides a wide variety of options for filtering your search.

The results lead off with a clearly marked group of most popular site, then the first 10 of all the other relevant sites found. A grouping of related news articles is displayed third, followed by a group of shopping-oriented links.

http://www.lycos.com

■ **Northern Light.** This site became a favorite among serious researchers in part because it has a special collection of files that other search engines can't reach. Included are files from trade journals and databases normally available only to subscribers as well as similar materials. While you can find these files for free, there is a small fee to read them (usually between $1 and $4). Another advantage to Northern Light is a directory-like approach to help you narrow your search. For example, you'll find nearly 760,000 sites on the list if you enter the term "geology." Northern Light offers users the option of narrowing the search to such subtopics as marine geology, paleontology, mineralogy, and more. And you have the option to narrow the search even further if required.

http://www.northernlight.coms

■ **Yahoo!.** Yahoo! is one of the oldest and best-known search sites. This site is actually a search directory rather than a search engine. You can search through Yahoo! using a licensed version of Google's engine. The sites in Yahoo!'s database are all categorized by human beings rather than by software. You can search the site by keywords just as with any other search site, but it's the outstanding index that makes Yahoo! so exceptional. An index is particularly useful when you have a broad starting topic and are seeking ways to narrow it down or when you know what type of information you're seeking but are likely to be overwhelmed with the returns of any keyword search. For example, if you are searching for a reference on converting weights and measures, you'd click on the Reference topic, then the Measurements And Units subtopic, and finally the Conversion category to find a link to a list of 29 online converters. Pick the one that seems most appropriate to your needs.

http://www.yahoo.com

(*NOTE: Please see the "Summarizing The Top Search Engines" chart online at http://www.smartcomputing.com/pct/jan2001/MainEngines.*)

by Steve A. Glaser and Elizabeth Lewis

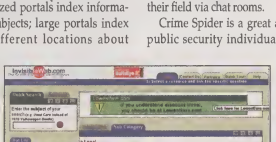
Specialized Search Engines

Delve Deeper Into The Web

When they surf for information on the Internet, the first place most users visit is a large search engine such as Yahoo!, MSN, or Lycos. Sometimes it feels like the old needle in a haystack analogy: information is so hard to find in the vast expanse of the Web that it almost seems impossible to find the right data. What many people do not realize is that there are other, lesser-known search engines that can curb the amount of time one spends looking for information.

In addition to the well-known Web sites, there are many search engine portals that will lead users to the specialized information they may be looking for. Portals such as Invisible Web (http://www.invisibleweb.com), Web Data (http://www.webdata.com), Beaucoup (http://www.beaucoup.com), All Search Engines (http://www.allsearchengines.com), Internets (http://www.internets.com), and Search Engine (http://www.searchengine.com) link users to search engines that specialize in a very wide range of topics. These portals can cut the large amount of time spent surfing for specialized information regardless of whether a user is in need of legal advice or shopping for a used car.

The aforementioned portals contain many large databases of search engines and other archives. This is how they work: the portals connect users to search engines by target information instead of by word like the larger search engines. When a user conducts a search on one of these targeted portals, he is presented with a categorization of topics rather than a huge number of web pages to sift through. What differentiates the specialized portals from the larger search engines is the way information is indexed. Specialized portals index information into related subjects; large portals index data found in different locations about all subject matters. Most of this information tends to be quite irrelevant for very specific research, so specialized search engines are very helpful when the user is looking for really in-depth information about a special topic.



Invisible Web's legal section offers many options for curious users.

For example, if someone is surfing for information about men's health, the user can conduct a search on Invisible Web and select the Health category. That search brings up a listing of 15 subcategories and a grouping of Web page matches that are listed in alphabetical order. The individual can then choose Men's Health, which is one of the subcategories, or browse through the Web pages to find the needed information.

The subcategories from the portals link the user with specialized search engines and reduce the amount of time spent trying to locate information. The most valuable aspect of these portals is the fact that they save time. If a police officer is looking for similarities between crimes in her town and in other locations nationwide, she may find critical information on a site such as Crime Spider. A young mother may have misplaced the dosing instructions for her toddler's cough syrup and the convenience of Rx List could save her a trip to the drugstore or a call to a physician.

■ **Police Go Online.** Police officers and other individuals in law enforcement and public safety will be able to gather helpful information from search engines, such as LEO Links (http://www.leolinks.com) and Crime Spider (http://www.crimespider.com). These search engines are geared toward police work; LEO Links has numerous categories, including police associations, administrative support, education, officer home pages, and family information. It also provides links where police can order uniforms, body armor, surveillance equipment, and textbooks. Officers have hands-on information about missing persons, gangs, employment and career links; they can also talk to others in their field via chat rooms.

Crime Spider is a great asset for police and public security individuals. The portal lists more than 100 topics of interest to law enforcement professionals and crime buffs. Search categories include child abuse, spousal abuse, crime labs, mass murderers, serial killers, cyber crime, and crime headlines and news. Crime Spider's purpose is to link key Web sites that contain information for law enforcement so that data can be quickly

referenced and gathered. This is a good site for someone in the field of criminal justice or anyone who is interested in learning more about crime.

Cop-friendly LeoLinks directs law enforcement to relevant sites.

The internet Doctor Is in.

People are surfing the Web and looking for answers to their medical questions. The Internet is a helpful resource for finding more information on prescriptions, doctors, health conditions, and even medical plans. You just need to know where to look.

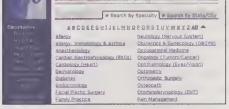
RxList (http://www.rxlist.com) has information about virtually any drug in existence. Maybe your mother is taking the breast cancer drug Tamoxifen, your grandson is on Claritin-D for allergies, or perhaps you just want some information on penicillin. This site provides critical information about each drug and covers topics such as dosing instructions, side effects, and storage. It also notes generic drug names and informs readers of potential drug interactions. The information database is updated every few days and users can link to an online pharmacy to order prescriptions and purchase vitamins and supplements.

Doctor Directory (http://www.doctordirectory.com) and Health Plan Directory (http://www.healthplandirectory.com) are exactly what they sound like. These search engines assist users in locating doctors in their respective areas. Doctor Directory works by finding physicians who specialize in everything from asthma, to mental health, to pregnancy, to infectious diseases. The directory provides office locations and phone numbers so that surfers can find a physician nearby. Health Plan Directory helps people find information regarding their own medical benefits or locate a plan that best suits their needs.

The Doctor Page (http://www.doctorpage.com) site has an expansive list of diseases and conditions with links to related information. The engine also has a large section devoted to cosmetic surgery procedures and users can search for physicians and hospitals by state. Health Link USA (http://www.healthlinkusa.com) is another site that lists conditions and illnesses from bedwetting, to Down's Syndrome, to rheumatic fever. Treatment, cure, advice, and help can be found for each condition. The Health Link USA portal also provides interesting health facts that are posted daily. Med Explorer (http://www.medexplorer.com) links users with hospitals that specialize in certain areas of medicine. For example, if you know someone with pancreatic cancer, you can find the hospital that performs the most procedures and research in that area.

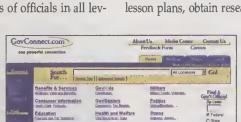
Government Info At Your Fingertips.

Supervising Uncle Sam was never so easy. Looking for information about NASA or your driver's license can be as simple as a couple of keystrokes. GovConnect (http://www.govconnect.com) provides data on federal, state, and local government. A search by ZIP code gives the user the names of officials in all levels of government. A subcategory on the site is designed for children so that they can learn about the Constitution, federal holidays, and national symbols.



Physicians are listed by state and by specialty on DoctorDirectory.com.

The FedWorld site (http://www.fedworld.gov/search.htm) is another government specialty search engine that lists different databases to explore (for example, the EPA's Clean Air Act or Supreme Court Decisions from 1937 to 1975). In addition, you can run a search on the U.S. Customs Service, the Bureau of Indian Affairs, the IRS, and several other government agencies. Government jobs are also posted in a searchable database.



GovConnect.com links users to information on all areas of government.

Lessons From Cyberspace.

Teachers are always looking for new ways to help their students learn. But the lesson plans sometimes seem old, stale, and overused. Educational professionals have two great online assets that can both save the day and help students become better performers. Awesome Library (http://www.awesomelibrary.org) and Education World (http://www.educationworld.com) are jam-packed with information to help students and teachers make the learning experience fun and enjoyable.

Awesome Library contains more than 15,000 resources on topics ranging from ancient Incan civilizations, to the Flemish language, to nutrition. The engine is set up so that students, teachers, parents, and community members can find data specially tailored to their respective group. In this manner, information for students is different than the data available to teachers. Other educators such as school nurses, counselors, and principals can keep up-to-date on topics that are relevant to them. A section labeled Hot Topics is geared toward key issues such as gun control, homeschooling, and current events. Awesome Library reviews all material for quality purposes before adding a link to its own site. All resources connected to this search engine are child-friendly and are considered useful for children and teachers.

Education World is a search engine for teachers. The site links educators to stories and articles on current events and other newsworthy information. Teachers can glean new ideas for lesson plans, obtain research materials, and access articles by other educators. The Education World portal also provides teachers with themes (such as women's history) that they can use in the classroom; also featured are timelines for teaching. Information about national and state standards can also be found here.

Online Grammar Tools.

It used to be that when you needed to find the definition of a word, you had to look in a dictionary. With the wonderful world of the Internet, who needs a

hardcover dictionary when everything you need is online? These online gems offer much more than just the definition of a word. You can see what the word looks like translated into Portuguese or learn a new word every day of the week.

Your Dictionary (http://www.yourdictionary.com) is a wonderful online resource for adults and children. This site locates and translates words in more than 240 languages. There are more than 50 specialty dictionaries that cater to such wide-ranging topics as golf, medicine, law, and space. Your Dictionary provides language tools such as a thesaurus, explanations of antonyms and synonyms, and information on the Braille alphabet. The site also tests the user's knowledge with challenges such as word games and crossword puzzles. Another really interesting feature is the information on languages that are on their way to becoming extinct. Yes, even languages can go the way of the dodo bird and the dinosaur.

Awesome Library provides noteworthy links for students and educators.

Another dictionary site is Foreign Word (http://www.foreignword.com). It is not as extensive or descriptive as Your Dictionary, but it is still a very useful site. Foreign Word contains more than 168 online dictionaries for 61 different languages. Words or phrases can be translated into more than 30 languages. The site also posts information about making a career choice as a translator.

■ The Internet: More Than Child's Play.

The Internet is one of the best tools to teach and entertain children. There are sites devoted to helping kids with their homework and teaching them about interesting topics such as art, science, and current events. There are also fun places where kids can chat with other kids and play games. However, as with any good thing there are some drawbacks.

Many parents fear letting their children surf the Web because of the many lurking dangers found online. But the anonymous and possibly dangerous stranger behind another monitor is not a parent's only online nightmare; pornography and violent sites are within any child's reach with the simple click of a button.

Because they represent a significant number of Web surfers, children are the focus of many specially tailored web sites. Many of these portals employ a variety of safety features to ensure a clean, pleasant, educational experience for kids and their parents. Nearly all of these kid-friendly sites warn that while they are geared toward keeping content and material secure, no safety device is 100% foolproof and a parent or guardian must always monitor their child's online activities to ensure the safest experience.

■ The Best For Little People.

Surf Monkey (http://www.surfmonkey.com) is one of the best search engines for children. Its bold, vibrant colors are eye-catching and the vast topics will grab any child's attention and encourage them to learn more. Categories range from learning Swahili or another foreign language to taking online art lessons, to obtaining information about NASA and the space program. Kids will love the unique categories that are defined with such nifty names as techie (computer-related topics), playful (sports information), brainy (educational things), and spacey (information about outer space), among others.

Surf Monkey has several safety features, as opposed to some of the other kid-oriented search engines which only use one or two. The engine's mission is to allow children to utilize the Internet to learn, communicate, and play while avoiding harmful and inappropriate content. Surf Monkey has a unique Cyber Friends List feature that lets parents create an address book of contacts for children. Kids are encouraged to send and receive e-mail using the contacts that their parents set up, but they can also receive messages from individuals outside this address book. Messages coming in to a child's inbox are subject to a parent's supervision and are locked out with a password.

Surf Monkey makes going online kid-friendly and safe for youngsters.

A customizable filtering technology prevents kids from accessing information about five critical topics: drugs/alcohol/tobacco, gambling, hate speech, sexually explicit content, and violence. This technology can also be set up to restrict access to fifteen other types of sites that include entertainment, shopping, sports, and other content. The Surf Monkey Bar is a free navigational toolbar that creates additional safety features for children. Kids can surf the Web but the filtering feature of the toolbar prevents them from visiting inappropriate web sites. Parents can turn this feature off with a password when they want to do their own surfing.

Your Dictionary's engine has 85 specialty dictionaries for those hard-to-find words.

■ Educational, Fun & Safe.

Zeeks.com (http://www.zeeks.com) is a family-friendly site with cheerful, bright content. Some of its features include an e-zine called Nikki's that provides history and facts on subjects of interest to children; Ask Margo, a type of Dear Abby forum where kids can ask questions about any topic they wish and have someone provide answers; Surf Shack, a spot that features a neat site of the week; and various types of recreational activities including checkers, dominos, brain teasers, and sports-themed games. As kids participate in online games, educational projects, and other key features of the Zeeks.com Web site, they earn points. They can redeem these points for merchandise at the online ZeekStore.

The Zeeks.com portal requires that all children who sign in on the site use a nickname for communication rather than their real names. Parents are required to provide permission for any child under the age of thirteen purchasing merchandise from the ZeekStore. In terms of other safety features, Zeeks.com uses a word filter to prevent kids from visiting sites with sexually explicit, violent, or inappropriate content.

Kids can find a multitude of games at Zeek.com.

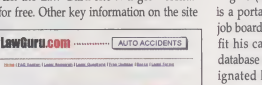
Every item that is submitted to the Web site for posting is subject to careful screening by Zeeks.com to ensure that it is relevant and safe for children.

Like Surf Monkey, Zeeks.com offers ZeekSafe, a free Web browser for kids so that they can surf the Web without stumbling onto pages that contain inappropriate material. ZeekSafe denies access to more than 150,000 sites that it deems unfit for kids and is updated often. Another neat feature of Zeeks.com is the ability to block advertising. Parents can opt for this and their children will be able to view the search engine without advertising; educational banners appear instead. But, blocking advertising comes with a price. If parents choose to have ads removed from their children's viewing eyes, they must pay a fee to subscribe to Zeeks.com.

■ **More Search Engines For Kids.** Other notable search engines that are kid-friendly include Web Kangaroo (http://www.webkangaroo.com), Kids Nook (http://www.kidsnook.com), Super Kids (http://www.super-kids.com) and Yahooligans!. Kids Nook is very educational and has some helpful links and ideas for teachers. Web Kangaroo is geared toward searching on topics such as entertainment (movies, videos, TV), food (recipes, drinks), and toys. Web Kangaroo filters out unsuitable content and parents are asked to notify Web Kangaroo if they find any pages with harmful material elsewhere so that the site can add those links to the list of off-limit sites. Super Kids links children to sites with interesting topics such as animals, news, science, and countries. All sites are reviewed before they are added to the portal's database.

Yahooligans! looks much like its mother engine, Yahoo!, but with a splash of color and kid-oriented topics. The safety feature on the site is moderated chat, which allows kids to communicate online without the parental worry of unfit content such as pornography or hate material. A moderator oversees messages before a child can retrieve them and intercepts the messages if they are not considered safe for little eyes.

■ **I Found The Law.** Did you know that it is against the law for a man to be seen in public in a strapless gown in Florida? Well, visit the Law Guru (http://www.lawguru.com) Web site and learn more about some of the weird laws in the United States and worldwide. Law Guru is geared toward people who are already lawyers or who are working toward a career in law, but other individuals seeking legal advice can visit the Law Guru site and get information for free. Other key information on the site



You'll find many frequently asked questions and loads of legal advice at Lawguru.com.

includes FAQs on various law subjects, an online law bookstore, legal forms, news about law, and the opportunity for practicing attorneys to join an online law network. Another legal site is Attorney Pages (http://www.attorneypages.com), which directs users to lawyers who specialize in more than 40 different types of law including estate planning, sexual harassment, and product liability.

Looking for a lawyer, finding a law school, or getting an answer to a legal question can be a snap with search engines such as Internet Legal Resource Guide (http://www.ilrg.com), Find Law (http://www.findlaw.com), and Mega Law (http://www.megalaw.com). These portals have lots of links for someone who is studying for a law degree or just interested in legal issues and looking for some information.

All types of car information can be found at Autoweb.

■ **Other Noteworthy Portals.** The Vets.Com (http://www.vets.com) site might pique the interest of those who have served in our nation's armed forces. This site is devoted to all issues that concern veterans, from categories on health and medical problems to the latest edition of the veterans' manual, to job assistance, to online memorials. There is even a section where veterans can connect with the alumni associations for all branches of the United States military.

When users surf the Internet in a career or job search, it can take hours of precious time to find jobs that fit their needs. Hundreds of sites claim to have all the right jobs, but Job Search Engine (http://www.job-search-engine.com) is a portal that browses various job sites and job boards to connect a user with matches that fit his career interests. When querying the database for a particular job position in a designated location, Job Search Engine comes back with a listing of matches on each job site (for example, Career Mosaic, HeadHunter, Monster.com). Manual searches through individual job sites will no longer be your bane once you have Job Search Engine secured under your belt.

Cars are a status symbol for some people, and others only think about their vehicle when it fails to start on a cold morning. Car Times (http://www.cartimes.com) changes all that. Whether you are renting a limo for the prom, buying a used Toyota, or are interested in the Indianapolis 500, this site is packed with an amazing amount of automotive information. Car Times is extensive in every respect and provides traffic updates, lemon law information, and the latest details on which manufacturers are offering rebates and incentives. Autoweb (http://www.autoweb.com) is another automotive search engine, but this site concentrates on finding online deals for prospective car buyers.

Regardless of your fancy, there is probably a search engine out there to cater to your needs. The next time you need data on a particular subject in a hurry, check out one of the search engine portals and you will be on your way in no time. GS

by Karen M. Spring

Souped-Up Searches

Find What You Need Faster

By now, Web searching is something we all take for granted. Almost every browser home page we visit features a search input field. When we want to find information about virtually any conceivable topic, we only need to enter a query, click the Search button, and wait a few seconds for the planet to be combed and yield up its finest pages for our perusal, right?

Any Web searcher knows it's not that easy. The level of precision behind most Web searching is comparable to sculpting a Zen rock garden with a bulldozer. Searches are typically time-consuming, frustrating, and wildly inaccurate—unless you know a few secrets.

Whether you're a Web novice or a seasoned search veteran, you can always learn more about searching effectively because the Web is constantly changing. For instance, not so long ago, the greatest strategy for site designers to get their pages noticed was to pack their HTML (Hypertext Markup Language) code with meta tags that associated specific keywords with the document. Search engines then looked for documents with meta tag keywords that closely matched the search query. However, merchants and pornographic sites began to abuse meta tags, flooding Web pages with any word, whether it was related to the page or not, that might persuade a search engine to boost the document's "relevancy" ranking. Today, most search engines completely ignore meta tags.

So it pays to keep abreast of the newest search strategies, no matter what your skill level is. Here, we've culled together some of the best techniques we've found for cutting through the rubble of today's Web and extracting the information you need.

Match Your Search To The Site.

Despite the fact that most corner convenience stores sell wine, you probably wouldn't visit one to purchase a rare chardonnay. Similarly, one search site is probably not going to meet all your research needs.

First, you need to realize that there are really three kinds of so-called search engines: true search engines, Web directories, and hybrids that offer a combination of those two services. A true search engine uses automated programs called robots (or bots or spiders) to crawl across the Web's thousands of servers and systematically catalog their contents. They then weed out as much garbage as possible and store a copy of the page on the engine's own servers for subsequent analysis.

A Web directory employs humans to put Web pages into a hierarchical subject database based on the contents on those pages. Yahoo! is the best-known example of a Web directory. Finally, a hybrid is a combination of these two search mechanisms and runs them side-by-side. Nearly all the major search sites are now hybrids. In fact, even Yahoo! contracts with Google to provide search engine results.

This is significant because search engines and directories specialize in offering different types of information. A directory is much more likely to offer useful home pages within a given subject. For example, if you want information about a particular subject, such as "London Underground," a directory such as Yahoo! will present you with its own categories and site matches first and then refer you to Google matches for even more detail.

Yahoo! can save you huge amounts of time spent digging through search hits because returns are shown in the context of their hierarchy. For instance, if you were looking for information about London's mass transit system, you would immediately know the London Transport link, which is found by clicking Regional, Countries, United Kingdom, England, Counties And Regions, Greater London, Travel And Transportation, and Mass Transit, would offer more appropriate content than the hit for Underground, which is found under Entertainment, Movies And Film, Titles, and Independent.

On the other hand, a directory is likely to prove ineffective for such searching oddball topics as "food blender accidents." Only two or three pages on the entire Web may offer

pertinent information, so you'll need a far-reaching search engine to find them. However, realize that, at best, the largest engines only catalog about half of the Web's contents. And, if a search engine covers more content, the chances are better that many stored documents will be out of date, which can result in erroneous information or the dreaded "Error 404—File Not Found" message being returned.

■ **Be A Nomad.** We humans are creatures of habit and comfort who love convenience. This is why Web services, such as MSN, AOL, and Yahoo!, consistently garner the top numbers in Web traffic—they keep people coming back by making life easier for them. Most of us now use search-enabled portal sites as our browsers' home pages. The first thing you see on the Web is your local weather, stock portfolio, headline news, favorite team scores, and a little search query field. A common routine is to enter a two- or three-word search query; pan through the first 20 or so hits; and, if we don't find something satisfactory, give up and move on to another subject.

Instead, you should try wandering a bit. There are more than two dozen major search sites and each has its own strengths. Even if you run the same search at HotBot and NBCi, both of which use Inktomi's massive Web database, you may get the same results but displayed differently. If you don't get good results from Excite or Lycos, try Google, AltaVista, or both. Experiment with many search sites, and when you find a few that perform well, bookmark and make a habit of using them.

Also, don't necessarily settle for the first page or two of hits. If the data is important enough, be prepared to dig through 10 or 15 pages of returns. Relevancy is a quirky, shifting thing; if you *almost* used the right search phrase, the page you want may be there, but it may be buried farther down the hit list.

■ **Learn The Language.** Regardless of how a search site determines relevancy, no single practice will net you better results than learning advanced search syntax, or Boolean logic. Despite the academic-sounding name, Boolean is actually very straightforward and hinges on four operators: AND, NOT, OR, and NEAR.

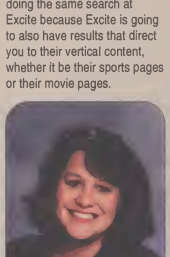
- AND ensures the two adjacent words are in your hit pages. "Tea AND England AND custom" would eliminate most hits that deal with commercial tea sales because few such sites are likely to discuss the history of British tea drinking.

Inside Information: Tasha Soudah, InfoSpace

InfoSpace is rapidly emerging as one of the dominant players in Internet content and service delivery. Following the recent acquisition of Go2Net, which owned the Dogpile and MetaCrawler sites, InfoSpace became the Internet's leading metasearch company. Tasha Soudah, who is the group product manager for search and directory, is recognized as one of InfoSpace's chief experts on search technology. Here, she shares some of her thoughts on the searching industry and special techniques for better results.

Q. Is there a difference between using a dedicated search engine and a portal search engine?

A. Portals are usually associated with a type of search engine, but they often provide a lot of their own content, like Yahoo! or Excite. So when you do a search on those sites, you sometimes get directed to other content that belongs in that portal. There is definitely a distinct difference between doing a search at Google and doing the same search at Excite because Excite is going to also have results that direct you to their vertical content, whether it be their sports pages or their movie pages.



Q. A lot of users have gravitated to making a portal their browser's home page, and that's the site they use for the majority of their searching. How do you persuade these users to come over and try your metasearch offerings?

A. We are definitely not trying to compete in the portal market, but we realize there is still a role for a pure search player out there—someone who really focuses on doing a search and doing it as well and as comprehensively as possible. So our statement for users like that is, "If you don't find it on Yahoo!, give us your next try."

Q. Is there such a thing as a search engine for a beginner or an advanced user?

A. I would say no. One of the benefits of MetaCrawler, Dogpile, or other metasearch engines is that they can compare the different results they get from different search engines and see which is returning the best hits for their query. The other benefit to a beginner is if they are starting to experiment with things like using pluses or quotes or other query syntax in the search field. For instance, some search engines accept quotes, some don't. We translate that syntax into whatever works for the search engines we're partnering with.

Q. Given all the advanced options in search engines now, is there any point to learning Boolean logic syntax?

A. If you're a serious researcher, sure. I think there definitely is because your results will be better. Still, I think that some of the real simple operators—pluses, minuses, [and] quotation marks—are all a basic Web user needs to know.

Q. What is the single best searching tip you could offer a beginner?

A. A lot of people think that you can type in one word and expect what you want to come back immediately. But you wouldn't walk into a department store and just say "shoes." One of the things we've found out is that 98% of the people that search our engines just type in a couple words. In a lot of cases, that isn't going to do it. A tip would be to really think about what you put into the search box. If you're looking for shoes, you might want to put in "dress shoes for formal occasions." □

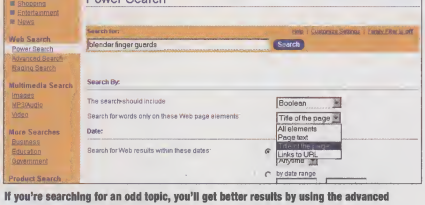
- NOT eliminates the following word from your search returns. "Taurus NOT car" is likely to eliminate pages that deal with Ford Motor Co.
- OR dictates that either of the adjacent words can be present on the page. "Dictionary OR thesaurus" will net you pages that deal with both types of reference book.
- NEAR instructs the engine to look for pages that contain both your terms in a given proximity to one another. "Cancer NEAR/5 horoscope" means you only want pages where the words Cancer and horoscope appear within five words of each other.

The other two elements of advanced searching used in conjunction with Boolean operators are parentheses and quotation marks. Parentheses help group words within a larger search phrase, as in "Ford AND (Lincoln OR Theater) NOT (car or auto*)." This phrase will help find pages that deal with President Lincoln's assassination at the Ford Theater but also will exclude pages that deal with automobiles. Note that we used the asterisk (*) wildcard character in a search technique called stemming. This is a quick way to cover variations of a word; in this case, we're excluding all words that begin with "auto," including auto, autos, automobile, and automobiles.

Quotation marks instruct a search engine to look for an exact phrase. Some engines automatically default to searching the exact phrase but others don't, so it's a good idea to use the punctuation just in case. For example, typing **"National Geographic Maps"** will return pages that deal with that specific piece of software, as opposed to pages that mention *National Geographic* magazine and also use the word "maps" elsewhere. Capitalizing "Maps" also helps because although lowercase characters will match either upper- or lowercase words, uppercase searches will only generate uppercase words.

If you want to get extremely precise, learn the art of field searching; that is, incorporating limiters your engine can use to dictate how and where a search is done. Incorporating the term "url:smartcomputing.com" into your query will restrict all hits to pages found at Smart Computing's Web site. Similarly, you may want to eliminate the swarm of dot-com sites from your results and only look at government or nonprofit sites. You can do this by adding the phrase "(domain:gov OR domain:org)." (Note that this also will exclude most foreign sites, which usually end with country domains such as .uk or .jp.) Similar field commands exist for searching page titles (title:), specific servers (host:), finding pages that link to a specific URL (link:), and even the names of specific graphics (image:).

Although effective Boolean searches are very powerful, most people don't know how to use them. In addition, fewer and fewer engines allow full-blown Boolean searching; instead, they use shortcuts and offer forms that simulate Boolean syntax, most often by following links to "Advanced Search" pages. The most common shortcuts are the plus (+) and minus (-) symbols, which work the same as the AND and NOT operators.



If you're searching for an odd topic, you'll get better results by using the advanced options that a powerful search engine offers.

■ **Advanced Search Screens.** Most engines offer at least one page for advanced searches. Whereas the main home page typically supports basic searching (phrases with arithmetic shortcuts), advanced pages will offer a much broader array of options. HotBot's advanced page, for example, lets you search with Boolean syntax as well as use input fields with operator options, such as "must contain," "should contain," and "must not contain." You also can filter results according to a page's date, what multimedia elements it contains, what domain it appears in, and more.

AltaVista, which is probably the most robust engine available today, offers four different search screens. The main screen on AltaVista's home page supports shortcut operators, phrase searches, and lets you select which language your hits should be in. AltaVista's Power Search is very similar to HotBot's Advanced Search and allows you to filter results by date and region, as well as whether you want to search a page's text, title, or links. AltaVista's Advanced Search is dedicated to Boolean queries, but it also adds some handy extras, including the ability to sort results by prioritizing certain words and setting date ranges. Finally, AltaVista's Raging Search is similar to Google in that it offers a bare-bones input field that generates results based on link analysis.

Link analysis establishes relevancy by analyzing how many other Web pages link to a given page. For example, the U.S. Department of Agriculture and your uncle Bob may both have pages that discuss pesticides, but because the Department of Agriculture will have many more outside sources linking to its site than uncle Bob will, link analysis will give the Department of Agriculture higher relevancy.

The first thing you should do when dealing with a new search engine is read its help pages. These will give you instructions for optimizing your searches for the site's own syntax, thus saving you time you might have used entering unrecognizable queries. For instance, if you didn't read the help pages, you wouldn't know that advanced AltaVista queries don't support + and - symbols.

■ **Metasearching.** Rather than search through engines and directories individually, you can use a metasearch engine to query several at once. InfoSpace (http://www.infospace.com), which owns both Dogpile (http://www.dogpile.com) and MetaCrawler (http://www.metacrawler.com), is probably the leader in metasearching, but the lesser-known ixquick

Experts are mixed in their opinions of exactly how useful metasearching is, but they all agree that for quick results on well-documented topics, a metasearch engine will help find the most relevant pages.

(http://www.ixquick.com) may offer better functionality.

Experts are mixed in their opinions of exactly how useful metasearching is, but they all agree that for quick results on well-documented topics, a metasearch engine will help find the most relevant pages. By the same token, only two or three of the top dozen engines may catalog a very obscure page. You may spend hours digging for the page through individual searching whereas a metasearch would discover the hit almost immediately.

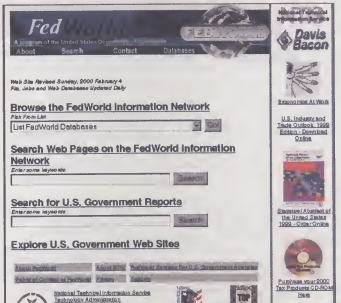
For improved accuracy, you should consider a metasearch utility that runs from your hard drive. They process your request through Web-based search engines, but the sorting and analysis of returns is done on your own computer, and the results can be permanently stored. These utilities generally query more engines and do a better job of eliminating dead links and extraneous information. The trade-off is that their processing time may be inconvenient, especially if you have a slower system.

If you want to experiment with search utilities, check out IntelliSeek's BullsEye 2 (http://info.intelliseek.com/prod/bullseye.htm), BlueSquirrel's WebSeeker (http://www.bluesquirrel.com), or the much-praised Copernic from Copernic Technologies (http://www.copernic.com). For more information about these utilities, see "Web-Search Software" in this issue.

■ **Specialized Searches.** Often, if you want specific data, you need a specialized source. All the Yahoo!s, Excites, Lycoses, and AltaVistas of the Web may be great for finding scattered bits of information, but when it comes to deeply exploring a subject, you'll need a source dedicated to that area.

In the consumer space, a search engine dedicated to content in a single field or topic is known as "specialized," but in the corporate world, it's called "vertical." Unfortunately, there isn't one gateway that provides a window to every specialized or vertical search engine. AltaVista's More Searches area offers querying specific to business, education, and government, but your best bet is to use a more single-purpose engine. You may even need to do a search for your search engine, such as "Oriental (recipe OR cooking) search."

In time, you'll find the best specialized search sites for your interests, so be sure to bookmark them. For instance, you'll find


Fed
World
Browse the FedWorld Information Network
Search Web Pages on the FedWorld Information Network
Search for U.S. Government Reports
Explore U.S. Government Web Sites

Instead of searching the entire Web for a very specific topic, try a specialized search site, such as FedWorld, which limits its content to U.S. government documents.

government documents at FedWorld (http://www.fedworld.gov), but FirstGov (http://www.firstgov.gov) is also great for general state and federal information. If you're doing legal searches, try FindLaw.com (http://www.findlaw.com). Of course, if you need computer information, you'll want to head to our Web site (http://www.smartcomputing.com) and access our searchable article archive and Computing Dictionary.

■ **Cache & Dash.** Once your searching offers up the perfect links, you should take steps to keep the critical information available. Don't merely assume if you run the same search on the same engine next week, the same results will appear because they probably won't. Pages often change their contents and addresses, and as the engine catalogs more documents, relevancy rankings will be affected, and the page you found might be bumped out of its former position.

If the document is important and you anticipate needing to return to it later, the least you can do is bookmark the page. You can do this in Microsoft Internet Explorer under My Favorites and in Netscape under Bookmarks. This will maintain a link to the page's URL on your system.

However, bookmarking won't help you if the page's contents change. The safest course is to actually cache the page and/or site on your hard drive. You can establish how many links deep the browser should extend in archiving a site, but be careful because it's easy to archive too deeply. If most of the information you need in a site is available within two links of the home page, it's OK to instruct the browser to archive the home page and all pages within two links of it. But if the home page links to another site, and the links from that page lead to massive graphics and PDF (Portable Document Format) files, you're in for a very long download filled with lots of data you probably don't need. A better course may be to archive just the individual pages you need.

Developing good habits like Boolean searching and local caching don't necessarily separate novices from experts, but they do separate the effective from the haphazard. Excellent search abilities aren't difficult, but they do take practice. The payoff will come every time you're in a hurry, need the right detail, and can find it even before others give up. 65

by William Van Winkle

Yahoo!

Use This Web Directory To Energize Your Search

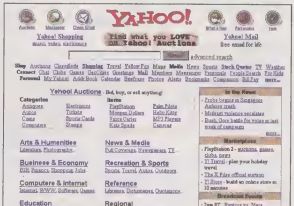
When you log on to the Internet, you expect to find the information you want quickly. However, it's not just the speed of your Internet connection that you need to think about. You can save time when you know how to navigate search engines and Web directories in the most efficient manner. Here, we have some tips for using Yahoo!'s Web directory.

General Search. When you navigate your Web browser to Yahoo!'s home page (http://www.yahoo.com), you'll see the search field displayed prominently at the top of the page. Unlike traditional search engines, which use software to search, or "crawl," the Web for sites and then index them according to keywords, Yahoo! is a subject-based directory. That means Yahoo! editors evaluate all the sites that people submit to Yahoo! and then organize them into a categorical system of categories and subcategories.

Use broad search terms. If you're planning your wedding and seeking the proper toast for the rehearsal dinner, begin your search by typing **wedding** in the search field and then click the Search button. The results page will reveal matches inside Yahoo!'s various property-specific pages (see more below), in Yahoo! categories, the most popular Web sites, and other Web sites. From there, you can narrow your focus to complete your search. In our example of finding the perfect wedding toast, the "wedding" search led to a category titled Traditions And Customs.

Search through Yahoo!'s categories. If you're not exactly sure what information you're looking for, you can just browse through the 14 main Yahoo! categories that are listed on the home page. Each main category houses dozens of subheadings, so begin with a category you're interested in and then explore its offerings. If a search reveals a link to a site you like, click the category where the site is classified to find sites similar to the one in which you are interested.

Narrow your results. If you are searching for a certain phrase, make sure to put it in quotation marks, such as **"Snow White and the Seven Dwarfs"**. If you want to specify words that must appear in the results, add a plus (+) sign; for example, **Blue +Ridge**. You also can specify words that you don't want to appear in the results by attaching a minus (-) sign, such as **beauty -beast**.



As the mother of all Web directories, Yahoo! rarely disappoints most people who search the Web there.

Advanced Yahoo! Search. Click the Advanced Search link next to the Yahoo! search field to designate more search options. These advanced options apply only to searches within Yahoo!'s directory.

Choose your search method. There are four options under the advanced search: Intelligent Default, An Exact Phrase Match, Matches On All Words, and Matches On Any Word. You also can select to search Yahoo! Categories or Web Sites. Here are some examples of how these choices can help accelerate your search.

Let's say you're a fan of the Grateful Dead. You may want to choose Intelligent Default and Web Sites to conduct a general search for sites related to the band. However, if you're looking for lyrics to a particular song, you'd do better by choosing An Exact Phrase Match and then typing in the song name.

The Matches On All Words choice is beneficial when you want to find specific information, but the keywords don't have to be in any certain order. For example, if you're going to Charleston, S.C. and you want to find the best seafood houses in the area, type **Charleston seafood restaurants** (not necessarily in that order) and select Matches On All Words.

The Matches On Any Words choice works well if you're having trouble getting enough results for a particular query. It will broaden your search if you look for matches on any of the keywords you type in.

Narrow the time period. You can limit your search by finding new listings that Yahoo! added within a certain time period. Click the down arrow in the next section to choose to find listings added in the past day, the past three days, the past week, the past month, the past three months, the past six months, or the past four years. This also helps you to eliminate receiving links to sites that haven't been updated in a long time.

Speed up your results. Finally, you'll see the results of your search sooner if you limit the number of matches that show up on each page. Click the down arrow in the final section of the Advanced Search page to choose to see 10, 20, 50, or 100 matches per page.

If your search keywords don't match any sites or categories within Yahoo!, you'll automatically be forwarded to Google, a full-text index of the entire Web. For more information about Google, see "Google" in this issue. 65

by Marla Hardee Milling

MSN Search

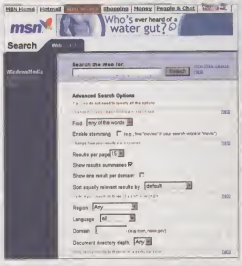
Microsoft's Engines Drive A Powerful Search Tool

When Microsoft asked you, "Where do you want to go today?" you may have replied, "To the Web site that has the information I need." Lucky for you, the company's Microsoft Network (MSN) offers a search page that will help you pinpoint the sites most useful to you. Here, we offer some tips to help you get the most out of using MSN Search (http://www.search.msn.com).

Start your search by typing keywords or a phrase into the search field at the top of the home page. MSN gives you room to type up to 150 characters in its search box. The search tool is not case-sensitive, so you can use all lowercase letters to find any results.

As with most search sites, the more keywords you enter, the narrower your results will be. Also, don't forget to check your spelling. Although MSN Search will correct many misspelled words, you may have one it doesn't recognize if you aren't getting the results you desire.

Another option for finding the information you want is to search through MSN's Web directory. The directory is divided into 10 main categories: Entertainment, Work & Money, Computing, Shopping, Connecting, Lifestyle, Library, Travel, Personal, and Lookup. Each category is divided into subcategories. For instance, under Lookup, you'll find Businesses, Horoscopes, Maps, News, Weather, and What's On.



You can further refine your search by using the Advanced Options, which are accessible by clicking the link of the same name on the MSN Search home page.

■ **Advanced Search.** Next to the search field, you'll see the Advanced Search link; click it to go to a page that offers several options to change how your search is interpreted and how the results are displayed. You don't need to specify all of the options for it to work; filling in only one field could considerably help your search.

Modify search word interpretation. The first option provides choices for how your keywords are matched up. If you click the down arrow next to Find, you'll see six options. Select Any Of The Words to list sites that contain at least one of the search words. All Of The Words reveals matches that contain all the keywords, but they may appear in an order different from the order you typed them. Words In Title brings back pages with titles that match your keywords. The Exact Phrase returns matches that are identical to the search phrase you typed. If you select Boolean Phrase, you can use Boolean operators, such as AND, OR, and NOT in your search. Finally, Links To URL lets you find any Web pages that link to a Web address you type in.

There's also a box underneath that drop-down menu that allows you to enable stemming. Stemming allows you to enter a root of a word and get back search results that are variations of that word. For example, a search for "school" will also show results for "schools" and "schooling."

Limit the number of results. The second advanced search option allows you to limit the number of results per page (10, 15, 20, or 50). There also is a box to check if you want to show result summaries. Leaving the box blank will hide the summaries and speed the load time of your search.

The next option is a box to check if you want to limit your search to one page per domain. This means that if many pages from one site show up in the results, you can limit it to show just one of those pages. Finally, the last choice in this section involves how the results are sorted. Date Descending will list recently updated sites first, Title Ascending will return the results alphabetically by title, and Depth Ascending will show you the pages that are closest to the root of the domain instead of those listed deeper within a directory.

Restrict results by origin. In the next section, you can narrow your search results to bring back pages from certain geographic regions or those in specific languages. You also can limit your search to a specific domain to reveal sites within a content category or specific country. For example, you could enter .edu for educational institutions or a particular country domain such as .jp (Japan) or .fr (France). Lastly, to limit the number of subdirectories revealed for each domain, open the pull-down next to Document Directory Depth and choose Any, 1, 2, 3, 4, or 5.

Search for recently updated sites. To weed out sites that haven't been updated in awhile, you can type in dates to restrict your search to sites that have been updated within that time period. Simply type in your date parameters in the empty fields.

Search for specific files or links. The final advanced search option allows you to search for sites that use certain audio, video, or graphics files or links. Just click the box next to any of the choices to have related sites show up in your search. The choices include: Images, Video, ActiveX, Shockwave, JavaScript, Audio, MP3 Audio, VBScript, Acrobat, and Java Applets.

Once you figure out where you want to go, hop on MSN Search to get there. With these tips, you'll be searching like a pro in no time. 65

by Marla Hardee Milling

Netscape Search

Navigate Your Way Through The Web

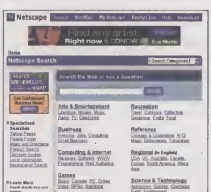
The name many users have trusted for the software to find content on the Web also has compiled a comprehensive Web directory. Netscape uses more than 14,000 volunteer editors who are knowledgeable in specific categories to organize the Netscape Open Directory. Presently, the directory boasts more than 800,000 sites that are compiled into more than 140,000 categories. We'll tell you how to get the best search results, and we'll show you some quick ways to find what you're looking for using your Netscape browser.

General Search. Begin your search by navigating to the Netscape Search site (http://search.netscape.com) and typing keywords or a question into the search field at the top of the page. Another option is to search a category you're particularly interested in. The main categories include: Arts & Entertainment, Business, Computing & Internet, Games, Health, Home & Family, Netscape, News, Recreation, Reference, Regional, Science & Technology, Shopping, Society & Lifestyles, Sports, and World.

Use Boolean operators. Although Boolean sounds like a really strange term, it is named for the British mathematician George Boole and refers to the logical relationship among items in a search. To narrow your Netscape search, you can use the Boolean operators AND, OR, and NOT between your keywords. All Netscape searches use AND as the default operator. For instance, a search for "mad hatter" is the same as a search for "mad AND hatter."

However, you will benefit more from using the AND operator in conjunction with OR and NOT. For example, if you want to find information about gray owls, but you're not sure if you have the correct spelling of the color, you would type gray **OR** grey **AND owl**. Similarly, you may want information about gray owls, but you don't want spotted owls to show up in the results. So, you would type gray owls **AND-NOT** spotted owls.

Play a wildcard. A wildcard is a symbol that replaces one or more characters in a word, or in this case, a search keyword. In the case of Netscape Search, the most useful wildcard is the asterisk (*). Using the asterisk wildcard is helpful when the term you're looking for may have a plural form or use one of several verb tenses. For instance, if you were looking for skating sites, you would type in **skat*** to get results that show such matches as skating, skates, skateboards, and inline skating.

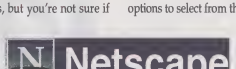


At Netscape Search's home page, you can search the Web by keyword or you can explore the 16 main categories of sites.

Conduct Specialized Searches. A menu that runs down the left-hand side of the page gives you easy access to specialized information. If you're looking for such information as maps, directions, or phone numbers, then this is the place to start your search. The specialized searches include Yellow Pages, People Finder, Maps And Directions, Product Search, Decision Guides, Local Information, and International Search.

Out of this group, Decision Guides needs further explanation. This specialized search feature allows you to find information on a variety of things, including used cars, business schools, restaurants, digital cameras, and much more. Then, the Decision Guide helps you make choices by asking questions about your needs and then providing comparisons.

To get started, click Decision Guides under the Specialized Searches banner. On the next page, select a subcategory from the 10 main category listings that are presented. For our example, we'll use Digital Cameras, which you'll find under Electronics. You will then have a few options to select from that will help you find the right product or service for you. First, you can enter keywords into the search field to narrow down what kind of camera you're looking for. Second, you can click through Netscape Search's question-and-answer guide for advice on which digital camera matches up with your needs. Or, you can use the Direct Compare Guide, which puts several digital cameras side-by-side so you can measure up their features.



Navigator Shortcuts. If you use Netscape Navigator 4.06 or newer as your Web browser, there are some shortcuts to finding what you want. Begin by typing keywords directly into the Address bar. If you type in a company or brand name, Navigator will take you directly to the company's Web site. For example, if you type in **Sears**, Navigator will take you to http://www.sears.com.

You also can get quick results by typing in keywords for what you hope to find. Say you want to find sites with information about iguanas. Just type **iguana** into the Address bar and the search results page reveals matches in four categories: Partner Search Results, Netscape Pages, Web Site Categories, and Reviewed Web Sites.

You can quickly find stock quotes by typing the word "quote" followed by a company's stock symbol in the Address bar. For example, typing quote **CSCO** will reveal the latest data on Cisco Systems' stock. Likewise, if you're in the mood to shop, just type **buy** followed by the item you're looking for, such as **buy** car.

Netscape also provides shortcuts for finding local information. In Navigator's Address bar, type [**your city**] followed by the information you're seeking. For instance, if you live in Chicago and you want to find a movie theatre, type **Chicago movies**. If you need directions to the theater, simply type **Chicago driving directions**.

by Marla Hardee Milling

Excite

Lively Results From An Old Pro

The hardest part about using Excite's search engine is locating it amid all the other features that dominate the Excite home page. Once you find the search engine, though, you'll have few problems locating the results you want.

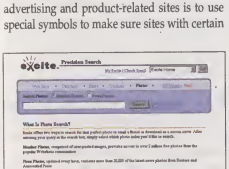
■ **General Search.** Excite's general search engine, Excite Precision Search, is located near the top of the Excite home page (http://www.excite.com). Just type your keywords or phrase in the text box and click Search. The Excite search engine will look through the 250 million documents in its index to return the most relevant and popular results. Here are some tips for finding just what you're looking for.

Narrow the results. To reduce the number of results Excite returns, type more words in the text box and make them more specific. Be as descriptive as you can in your search phrase. For instance, typing U.S. Open in the search box could return search results about tournaments from several sports. If you only want golf information, try typing **U.S. Open golf** instead.

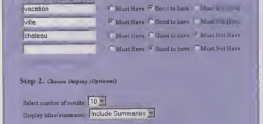
Use quotes. If you're searching for an exact phrase instead of using several independent keywords, surround the phrase with quotation marks. Web sites that contain the exact phrase in quotes will be returned before sites that simply contain all of the words in any order.

Avoid keywords. One method for avoiding advertising and product-related sites is to use special symbols to make sure sites with certain keywords are left out of your search. When you type your keywords in the Search text box, use a plus sign to include a keyword and a minus sign to exclude a keyword. To find sites about Mark McGwire that aren't related to collectible products, for example, type **+Mark +McGwire –collectibles –autographs –cards** in the Search text box.

Search by category. If you know the specific category you want to search in, click the appropriate link just under the Excite Precision Search text box. For example, if you're looking for information about news, click the News link, and if you're trying to find photographs, click the Photos link. (To avoid objectionable content when searching for photographs, you may want to make sure the Adult Filter is on.) The A/V link will take you to a search page where you can search for audio and video files, and the Voyeur link shows actual searches that people are conducting on Excite.



Use Excite's Precision Search to find photos, MP3 files, news, products, and more.



Excite's Advanced Web Search page lets you narrow the parameters of your search.

■ **Advanced Web Search.** If you aren't happy with the results of a general search, try an advanced search. Just click the Advanced Search link on the results page and then complete the four steps of the search that will more precisely target what you're looking for.

Prioritize keywords. When you enter a keyword into one of the three search text boxes in an Advanced Search, be sure to specify the importance of that keyword in the search. Click either the Must Have, Good To Have, or Must Not Have radio button so Excite knows more about what to look for. Also note that you shouldn't use Boolean operators (such as AND, NOT, and OR) or put quotes around keywords in these search text boxes.

Get faster results. If you want Excite to display your search results more quickly, you can limit the number of results Excite displays (10, 20, 30, or 50) or choose to have Excite only display the titles of matching Web pages. If you choose to see summaries along with the Web page titles, it will take the search results longer to display.

Choose a language. By default, Excite will return results predominantly in English. If you only want to see results in a certain language, select the language (there are 11 in all) you want from the Language drop-down menu.

Pick a domain. You can further narrow the results of your Excite search by choosing to see only sites with specific domain names. For instance, if you want Excite to return only the sites that contain .org in their domain name, select United States (.org) from the Country/Domain drop-down list. You can also choose to see only sites from other countries, such as Argentina or Singapore.

■ **Use A Directory Search.** You may find that using a directory search is an easier way to find information on a particular topic at Excite. Just beneath the Excite Precision Search box on the home page is the Explore Excite box. Here you can click a Directory such as Health, Entertainment, or Investing. From there, choose one of the subtopics to find information on the subject that interests you. Keep in mind that this type of search often only delivers information from Excite's resources, not the entire Web.

■ **Exciting Results.** Finding just what you were looking for, even if it happens only rarely, is very rewarding. Use these tips to search more successfully with Excite. GS

by Kyle Schurman

AltaVista

Put This Engine To Work For You

Searching at the AltaVista site is fairly straightforward because, unlike many other search engine sites, AltaVista still places its emphasis on searches. AltaVista lets you filter your search by either topic or specific keywords so you can be sure to find the information you need.

■ **General Search.** To use the basic search engine at AltaVista's home page (http://www.altavista.com), just type your keywords or search phrase in the text box at the top of the page and click Search or press ENTER. Those who use more specific and descriptive keywords will usually receive the best results. If you want to search for an exact phrase, be sure to enclose the phrase within quotation marks.

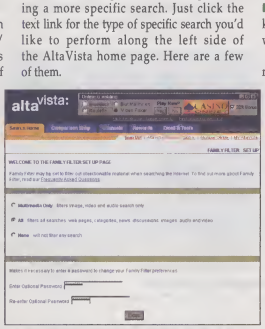
Look at the top. AltaVista may return hundreds of thousands of Web site links during your search, but we suggest that you focus on the first few sites near the top of the list. AltaVista has determined that these sites have the best chance of matching your search criteria.

Narrow the results. To narrow the number of results you received in your initial search, place a checkmark in the Search These Results checkbox and type a new set of keywords in the search text box. When you click the Search button, AltaVista will search for your new keywords only within the search results that were originally found.

Change the data provided. If AltaVista's search results aren't displaying the information you really want, such as the date a site was last modified, click the Customize Settings text link above the Search button on the home page. You can then select exactly which information will be displayed within your search results.

Use the Family Filter feature. The AltaVista Family Filter feature tells the search engine to ignore sites that are considered objectionable in content. Click the Family Filter Is Off text link above the Search button on the home page to view the Family Feature Setup Page, where you can determine what material should be filtered. You can also equip this feature with a password.

■ **Advanced Search.** AltaVista provides a few different opportunities for performing a more specific search. Just click the text link for the type of specific search you'd like to perform along the left side of the AltaVista home page. Here are a few of them.



You can create a password to use with AltaVista's Family Filter feature, which omits objectionable Web sites from search results.

Web search. If you want to look for information on the entire Web, you can perform a Power Search, an Advanced Search, or a Raging Search. The Power Search feature lets you specify a specific date range in which your results must fall. You can also ask that AltaVista only return results from a specific country.

Use the Advanced Search feature when you want to include Boolean operators, such as AND or NOT, to limit your search results. The Raging Search feature will take you to AltaVista's search engine, Raging Search (http://www.ragingsearch.com), which offers powerful search capabilities minus all of AltaVista's unique content features and complex graphics. Get tips for searching with this engine in "Raging Search: A Search Engine That's All The Rage" on page 127 of this issue.

Super Searches. You can choose to limit your searches to a specific topic, such as news items, entertainment stories, or shopping information. For example, when you click Entertainment Search under Super Searches, you will be able to search more specifically for things in the entertainment world. For example, you can look for MP3s, find your favorite radio station, or find out what's happening with your favorite movie star.

■ **Other Tips.** Here are a few other things to keep in mind when trying to find what you want on AltaVista.

Troubleshooting. Some of the most common problems at AltaVista involve problems with the Advanced Search feature. Keep in mind that some search filters that are allowed with a general search, such as quotation marks or plus or minus signs, aren't allowed with AltaVista's Advanced Search. In Advanced Search, AltaVista doesn't try to sort the search results for you; instead the results are ordered based entirely by your keywords and filters.

Avoid inconsistent results. When you use AltaVista's search engines at peak Internet usage times (usually afternoon through evening), you may not receive the exact same list of results from the exact same search twice in a row. During periods of high usage, some AltaVista computers may not be available, leading to odd search results. You could also receive results that change from time to time as AltaVista's automatic ordering of pages by relevance changes because of new information.

Use category searches. Some people find it easier to perform a search by clicking categories and subcategories rather than using keywords. AltaVista offers a search by categories (called a drill-down search) using the text links in the middle of the AltaVista home page.

■ **Get The Goods.** Whether you prefer to use the Advanced Search feature or search by drilling down through categories, you're sure to get a head start on that elusive information with AltaVista. GS

by Kyle Schurman

Raging Search

A Resource That's All The Rage

You will find Raging Search, which is powered by the AltaVista search engine, at http://www.ragingsearch.com. This search engine provides many ways for users to find the information they want. One way in which Raging Search works toward this goal is by indexing every word on over 350 million Web pages. Also helpful is the fact that Raging Search's index is consistently updated so that old, outdated pages are removed and new links are added. We'll show you the best way to use this comprehensive engine.

■ **Beyond The Basics.** By this point in Internet history, almost everyone knows how to work a search engine: You type in a keyword or phrase, click the Search button, and wait for the engine to display a results page. All engines are not created equal, though, and to really find what you need fast, you should know a few things about how each of them work.

Special fields. One way in which Raging Search helps you find exactly what you're looking for is by searching special fields. If you're looking for pages that have the word "school" in their hyperlinks, type anchor:school in the Search text box. Or, if you want to search only for pages that have the .org domain name, type domain:org in the Search text box. You can specify several other special fields; see Raging Search's Help page for a full list.

Customize your search. For a search experience that will help yield just what you want, click the Customize button next to the Search text box on the home page. You will see a dialog box with five tabs. Use the Results tab to pick and choose what information will display with your results. For example, you can choose whether you want the title highlighted, in what language it should be, and if each result has a description or just a title. The Page Layout tab lets you, among other things, determine how many results Raging Search displays at once.

The Design tab really has nothing to do with the success of your searches, but it may make the time you spend at Raging Search more enjoyable. You can choose what color scheme and font you want the site to appear in.

Like the Design tab, the Language tab is pretty self-explanatory. Use it to tell Raging Search what language you want the results to be in. You have quite a few choices, including Danish, Italian, and Greek. If you want to see results in any language, leave this section blank.

The final tab, Advanced Search, may be the most useful. In the Search Box section, for example, you can choose among Simple search, Advanced search, or Power search. Each changes the look of the Search text box on the home page. Click the Advanced radio button to search with Boolean operators, or click the Power radio button to exclude certain words from your search.

There are other options for customizing and narrowing your search in this dialog box. Do some exploring on your own to find the combination that works for you.

■ **A Successful Search.** While different search technologies can certainly mean the difference between a helpful search engine and a waste of your time, you can do your part by learning how to most effectively operate the search engine of your choice. GS

by Karen M. Spring

Ask Jeeves

Straight From The Butler To You

Ask Jeeves is a search engine that employs the world's first Internet butler to help users find the answers to all their questions. Are your planning a trip to Cape Cod, but you have no idea which seafood restaurant to try? Or Maybe you're trying to figure out how many countries exist in the world. Do you wonder why the sky is blue? Looking for a marketing job in Cleveland? Ask Jeeves has enabled people to find answers to these and many other questions.

■ **Asking With Ease.** One of the distinguishing characteristics of Ask Jeeves is that visitors can ask a question in plain English, and Jeeves will do his best to return a helpful answer. Whereas many sites ask you to determine what keyword or phrase would best help you find what you're looking for, Ask Jeeves lets you simply type in the question just as you would ask it of a friend sitting next to you. For example, we typed in **how do you make chocolate chip cookies**, and Ask Jeeves returned a link to a chocolate chip cookie recipe as the first result.

If you would rather search for yourself instead of asking a question, go to the Areas Of Interest section under the Search text box on the home page in order to search by category. In this section, you have many choices, including Recreation, Business, and Travel.

■ **A Little Help From A Friend.** On the results page beneath the results that Ask Jeeves thinks will be helpful, you will see a Similar Questions section. Here Ask Jeeves lists other users' questions that are similar to the one you asked. This may give you a better idea of a good way to ask questions or help narrow down your search.

Ask Jeeves ranks its results by popularity, so when you look at the Similar Questions section, you'll see that each result has an icon with five little figures next to it. If a site has previously been useful to users with similar questions, many of the little figures will be orange. If the site was not that useful, most of the figures will be gray.

■ **Ask Away.** The greatest asset of Ask Jeeves is that you don't have to put a lot of thought into the exact phrase you enter into the search text box. Just type in the question you have in mind, or simpler still, type in one word or phrase that comes to mind. Jeeves will do his best to bring you just what you're looking for. GS

by Karen M. Spring

Google

You'll Go Gaga Over This Tool's Speed

If you are carrying the weight of a research project on your shoulders, much like how the soldiers in Tim O'Brien's book "The Things They Carried" hauled their packs, you may find that Google (http://www.google.com) can lighten your load and ease your mind. After you try Google for the first time, you may quickly discover all other search engines pale in comparison. Google has networked thousands of its own computers to create an incredibly speedy search system. Plus, the site is not crammed with ads; rather, its clean design is one of the main reasons Google is so easy to use.

Google A Go-go. What Google has going for it that other search engines don't is incredible speed and a clever way of indexing. Google returns the results of your searches as fast as your modem or Internet connection can work and proves it by posting the time it required to run the search. For instance, we entered "Tim O'Brien and Things Carried" in the search field and were greeted with 4,960 hits in 1.17 seconds.

What you'll quickly realize is that the initial hits for your search tend to be right on the money. For instance, the first hit for our example search was an essay entitled, "Tim O'Brien and American National Identity." In addition, five of the next 10 hits were papers serious researchers could get a lot of information from, and the rest were Web sites that contained biographies about O'Brien.

Google indexes not by how many times your words appear in a site's source code, but rather how many links from other Web sites there are. Google's PageRank technology counts a link from one page to a second page as a "vote" for the second one. In other words, the reason so many valuable hits came up for "The Things They Carried" is because other people found these sites important enough to include links to them.

Go Get It. Now that you know how Google works, you need some tips on getting this racecar of a search engine to the finish line for you.

Keep it simple. Google doesn't support Boolean search operators such as "AND" and "OR," so just type in the basic words you need. You don't even need the correct capitalization. The terms "tim o'brien carried things" are all you need for the research mentioned above. If you're planning a vacation in Majorca, Spain, type **vacation majorca**. To further restrict your search so you don't end up with so many hits, you need to be a little more specific, so simply add more search terms.

Be positive (and negative). Google ignores such common words as "I," "the," "and," and "will." However, if you want to include such words in your search, you can add them back in with the plus (+) sign. For example, if you were searching for work by the columnist and graphic artist Daniel Will-Harris, Google would get confused and ignore part of this author's name. So, you would need to type **daniel +will harris**. Similarly, you can get results that don't include a given term by using a minus (-) sign, such as "paul mccartney -beatles."

Cut the stem. In order to make its type of searches accurate, Google does not use stemming or wildcards. For instance, searching for "econom" or "econom*" will not bring "economics" or "economy."

Feeling lucky? Right below where you type in your search terms on the home page are two buttons, Google Search and I'm Feeling Lucky. Clicking Google Search will start your search and return the list of sites Google found. However, using the I'm Feeling Lucky button will take you straight to the top-ranked Web site without giving you the whole list. 65

by Christopher Meeks

Direct Hit

Like Google, Direct Hit (http://www.directhit.com) does not rank the results of its searches by how many times your search words are in a site's source code. Instead, Direct Hit's unique approach analyzes the activity of millions of previous Internet searchers and bases its rankings on how many hits a site has received and how long searchers stayed at a site. Although Direct Hit did not score as highly as Google in finding "meaty" sites in our academic searches, it nonetheless is a valuable tool and gives researchers yet another approach to finding stubborn facts.

Direct Hit, which is a service of the Ask Jeeves (http://www.ask.com) search engine, has a home page that is similar to Yahoo!'s. You can explore either by entering search terms or by perusing such categories as Arts, Business, News, and Society. Hence, if you simply want to browse and let your curiosity do the clicking, Direct Hit can be a great place to go.

One of Direct Hit's best features is its Advanced Search. To get to it, click the Advanced Search link next to the search field at the top of the home page. You then can restrict your search to a geographic region or top-level domain and to certain text areas, such as the title or body. You can further hone your search in the Advanced Search Query line by using a plus sign (+) before a term to stipulate that a result must contain the term and by using a minus sign (-) before a term to specify that a result page must not contain the term. □

America Online

A Wealth Of Information For Nonmembers, Too

There is a good reason why AOL is so popular. Not only is AOL a gateway to the Internet, it also provides exclusive content to its subscribers. But even if you're not a subscriber to this service, you can still use AOL's resources to search for information.

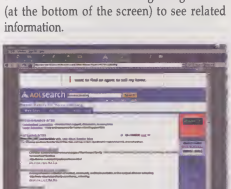
Log on to AOL.com (http://www.aol.com) and use their search engine, AOL Search, to quickly find information within AOL (if you're a member), on the Web, or both. Because it can simultaneously search both sources of data, AOL Search stands in sharp contrast to other search engines (such as Google) that only search the Web.

Before you start searching, however, keep in mind that AOL and the Web aren't exactly one and the same. Think of the Web as the entire world and AOL as a well-planned community within it. Just as you can look within your own city for a travel agent or doctor, you can search for data just within AOL. And just as you can look outside of your hometown for a specialized doctor, so you can cast a larger net by simultaneously searching both AOL and the Internet.

■ **Search By Category Or Text Box.** AOL Search lets you search in two different ways: by categories or by descriptive words. To do either, click the red Search button on AOL.com's home page. You will see the AOL Search page, complete with 16 main categories such as Recreation, Autos, and Reference. You can click any category to browse its subcategories. For example, click the Recreation hyperlink to display related subcategories, then choose Pets, which brings up another set of subcategories.

If you want to try for a more direct route to an answer, type a word or two in the Search text box and click the Search button or press Enter. For example, type **European villas** if you are looking for information on that subject. AOL's Search text box isn't case sensitive, so you don't have to worry about capitalization. After entering the search words, click the Search button, and AOL will look for information in a specific sequence. First it checks within its own content; then in its 2 million recommended sites, which are chosen and organized by 20,000 subject experts; and finally on the Web at large.

■ **The Results Are In.** When AOL is finished searching, you will see a Search Results page that shows a list of links to sites related to your search terms. The sites with the greatest number of your search word(s) appear at the top of the list, followed by others in descending order of significance. AOL's recommended sites are also listed at the top, followed by the best matching sites. When you see a link that looks promising, click it to see the associated page. Alternately, browse a link on the Matching Categories list (at the bottom of the screen) to see related information.



AOL Search displays its recommended sites first, followed by matching sites in order of relevancy to your search words.

If these search results don't suit your fancy, try clicking the Most Popular Sites link. This reshuffles the sites so that the sites with the most hits (request for a page) display first. To show the list in its original order, click the AOL.com And Web link. You can also view just AOL's sites by clicking the AOL Only link (for members only).

If searching by categories and the text box doesn't reveal anything useful, try using AOL Search's Related Hot Searches list. This list includes categories related (or alternative spellings) to the words you entered in the Search text box. For example, a search for the word "camping" may yield related searches for camping equipment and camping sites.

■ **Try, Try Again.** It's easy and painless to run another search if you don't like the results of the first one. Search text boxes appear at the bottom and top of the Search Results screen, making it convenient to enter different search words until you get a listing that you like.

Keep in mind, too, that you can always combine AOL Search's browsing and searching capabilities. Browse through the subject categories until you find a topic you want, then use search words to search within it.

■ **Refine Your Search.** If you've used several of AOL Search's tricks to limit your search and you still have an unwieldy number of sites to look through, try narrowing your search by using multiple search words instead of just a word or two. For example, if typing **travel** in the Search text box results in an impossibly long listing, type multiple words with a space between each: **travel Alaskan cruises**.

On the other hand, if your search results don't turn up enough links, try using fewer or alternate keywords. For example, instead of typing **Bavarian castles restaurants**, try typing just **Bavarian castles**. And don't forget to check your spelling; it's easy to misspell words when you're in a searching frenzy.

Use these tips to take advantage of the benefits of AOL Search. You'll gain efficiency by simultaneously searching AOL's content and the Web, and you'll generate a useful list of links to boot. GS

by Linda Bird

Web-Search Software

Powerful Programs Simplify The Information Hunt

Think of all of the newspapers and magazines to which you subscribe. You probably don't read every word of every issue. Most likely, you read your favorite sections or columnists, peruse headlines and ads, and save good feature articles for when you have time to sit down and thoroughly read them; however, you know it's simply impossible to digest everything.

Now, consider that the Web has more than 2.5 billion pages of information at your disposal, and 7 million more pages are added each day, according to the Cyveillance Web site (http://www.cyveillance.com). Thankfully, that amount of information is not dropped on your front porch or stuffed in your mailbox every morning. But sometimes finding what you're looking for on the Web can be as intimidating or as frustrating as paging through a monstrous newspaper or periodical.

Sure, search engines help with the hunt, and many well-known sites are dedicated to dispensing trustworthy, timely information about news, sports, finance, weather, and a number of other subjects. However, a search on a single search engine isn't exhaustive, and it often turns up dead links and unreliable sources. So, you end up jumping from search engine to search engine, wasting your time. But if you shun search engines and just stick to the sites you have bookmarked, you end upmissing out on too much good Web content.

This is where Web-search software can help you. This type of program can conduct customized searches for specific Web content and then help you store, organize, and update the information on your hard drive. We looked at three of the top Web-search programs on the market to give you an idea of how they work and how you can make them work best for you.

■ **go'trieve.** Chuck Shotton, the CEO of BIAP Systems, says go'trieve (http://www.biap.com) is like a Swiss Army Knife—it has so many tools, it's hard to succinctly sum up what it does, but we'll give it a try.

The power behind go'trieve is the "intelligent agents" that retrieve information according to the parameters you set. The first type of agent is the Smart Agent, which delivers text and graphics from the Web page of your choosing as often as every five minutes or just once a week. Thus, you don't have to remember or take the time to visit your favorite Web pages because go'trieve will do it for you.

The Smart Agent can only return information from one Web page, not a whole site. Consequently, you need to give the precise URL (universal resource locator; a Web address) of the Web page you want information from when configuring the agent. However, it is smart enough to remember a password or username that might be required to log on to a protected site.

The other intelligent agent is the Search Agent, which scans search engines looking for Web pages that contain the keywords you specify. To create this agent, you first select a search engine, such as Excite, Monster Job, or Google (go'trieve has a short predefined list from which you can choose), and then enter your keywords. Next, set the maximum number of results to return and determine how often you want the agent to look for new information.

Using the program's intelligent agents is only half the fun. The other half is choosing the format in which you want to view the retrieved information. After you download go'trieve, you'll have a shortcut on your Desktop; click this, and you'll go to the go'trieve home page. Then, click the My Pages icon to begin the process of customizing DailyNet, MyNewspaper, MyPortal, and MyWeblog, which are four different venues for publishing the information go'trieve gathers for you. Each of these comes with predefined content, such as Don Gillmor's eJournal, news headlines, and weather forecasts, and you can easily add other predefined information by selecting it from a drop-down menu. The Edit link on each of these publications opens the Page Builder tool, from which you can add either predefined content or the information your agents retrieve.

What's more, you can swap agents with friends and find other agents at no cost in the Marketplace on the BIAP Web site. Shotton says BIAP will add more agents, including user-submitted agents and ones that will enable online purchasing. The Add-ons section of the Marketplace offers such tools as online chat and stock quotes, and soon you'll be able to access skins, which will let you customize the look and style of your publications.

Regardless of whether it's predefined or the information your agents gather for you, the content of your publications retain the links

that will take you back to the original source. Plus, you can access your publications from any Internet-capable device, including PDAs (personal digital assistants) and pagers.

The cost for go'trieve, which you can download from the BIAP Web site, is $39.99 for a single-user license. If you don't feel like paying for the program, you can opt for the free sponsored version, which works the same as the standard version but displays advertisements on the home page. The go'trieve Pro version ($99) lets you create more powerful Smart Agents and take advantage of other features. All three versions run on Windows 95 or newer, and need either Microsoft Internet Explorer 4.1 or newer or Netscape Navigator 4.1 or newer.

■ **BullsEye 2.** The other two programs we tried were built on the premise that "man shall not live by one search engine alone." Obviously, no single search engine or tool can sift through all the contents of the Web by itself, but Bulls Eye 2 and BullsEye Pro from Intelliseek (http://www.intelliseek.com) are as good as they come. In fact, Intelliseek claims its products can search more than 60% of the Web. To do so, the programs' intelligent agents prowl more than 800 search engines and databases. But the real beauty of this comprehensive tool is that it's so easy to use.

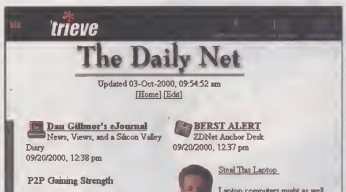
You begin by selecting a search area, such as the entire Web, News, Shopping, Computers, or Health and then a category, such as Books or Auctions under the Shopping area. Then, enter your keywords and click Search. The search results appear in an integrated browser, which means you can view the list of results and peruse Web pages on the same screen. For your convenience, the browser highlights your search terms on the Web page you are viewing.

Dead links and irrelevant pages may clutter your search results, but a quick click will remove the dead links or download and analyze the results to remove any irrelevant returns. Furthermore, you can refine your search by conducting a subsearch of the results by starting over with a Web-wide search or reviewing your past searches.

As with go'trieve, you don't have to keep what you find to yourself. Open the File menu and click Generate Report to save the search results as a report in text format, HTML (Hypertext Markup Language) format, or in a format that you can send to a handheld device. Now, you're ready to e-mail the report to a friend or coworker, or store it in a report folder. You also can save results on your hard drive.

The update of BullsEye 2, BullsEye 2.5, adds a few nice features, such as the ability to search country-specific Web sites, use shopping and auction agents, and add or change search engines. BullsEye 2.5, like its predecessor, is free and you can download it from the Intelliseek Web site.

BullsEye Pro, which is designed for marketing, consulting, and other business professionals, costs $249. In addition to offering the features of BullsEye 2x, the Pro version generates automatic reports for topics you define, tracks changes to Web pages, and sends e-mail notifications to your PC or handheld device—all without the advertisements that appear in BullsEye 2x. All versions require Win95 or newer or Windows NT 4.0 and either IE4 or newer or Navigator 4.0 or newer.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The Daily Net
Updated 03-Oct-2000, 09:54:52 am
[Home] [Edit]
Dan Gillmor's eJournal
News, Views, and a Silicon Valley Diary
09/20/2000, 12:38 pm
BERST ALERT
ZDNet Anchor Desk
09/20/2000, 12:37 pm
P2P Gaining Strength
Some of the leading lights in technology's latest genre--du-jour, known now as "peer
Steal That Laptop
Laptop computers might as well come with a sign on them that says "Steal Me." They're small,

Daily Net is one of four customizable publications in which you can read information that go'trieve gathers from the Web.

■ **Copernic 2000.** With its standard, Plus, and Pro versions, Copernic offers a Web-search program for everyone. In fact, all three versions are available in English and five other languages: French, German, Italian, Portuguese, and Spanish. When you download and install a copy of the free standard program from the Copernic Web site (http://www.copernic.com), you'll be asked if you also want to add another language or a country-based search category, such as Australia, Canada, or the United Kingdom. To run any version of Copernic, you'll need Win95 or newer and either Navigator 3.0 or newer or IE3 or newer.

Like BullsEye 2, Copernic 2000 lets you search multiple search engines categorically. The standard version combs more than 80 search engines and databases that are grouped into seven categories, including the Web, Newsgroups, E-mail addresses (for specialized sites, not individuals), Hardware, and Software. Once you select the category, you enter either keywords or a plain-English question and then choose whether Copernic should search for all words, any word, or the exact phrase.

Copernic will rank the list of search results by relevancy, delete any duplicate returns, and highlight the search terms. Unfortunately, unlike BullsEye, the search words are not highlighted on the Web pages that contain them. You can then choose to modify your search, refine it (run a subsearch of the results), download the returned documents, or validate the results, which removes all dead links from the returns. In addition, you can pass along results in text or HTML documents via e-mail.

If you're running the standard version of Copernic 2000, you'll notice dozens of inactive search categories, such as Business And Finance, MP3, Travel, Sports News, Encyclopedias, and Health. To access these categories, you'll need to upgrade to Copernic 2000 Plus, which searches more than 600 search engines and databases placed in 55 categories, without the presence of banner ads. The Plus version costs $39.95 for a single-user license, but special pricing is available for multiple copies.

Copernic 2000 Pro sells for $79.95 and gives its users similar advantages as BullsEye Pro. Although the number of search engines and databases it covers is the same as the Plus version, Pro will run search updates at any time you schedule and then send you e-mail messages with the results. And, the Validate, Download, and Refine features are automated.

Because all three of these meta-search tools are available in free, standard versions, we encourage you to try at least one of them. If you grow to rely on their superior searching abilities over those a search engine offers, you'll probably find the price for the upgrade to one of the pro versions is well worth the cost. GS

by Rachel Derowitsch

Get Your Site Noticed

Let Search Engines & Web Directories Help Surfers Find You

Submitting a Web site to the major search engines has become a prime component of just about every treatise on Web site marketing. Search engines, which are programs that scour a database of indexed Web sites in response to a user's search terms and then return probable matches, are a primary method for many Web visitors to find the sites they want to view. However, search engines also are invaluable marketing tools. A good search engine listing (one that shows up early in the results page) for a Web site can result in a dramatic increase in traffic.

With the billions of Web pages now in existence, it is impossible for search engines to locate and index every page. Estimates vary, but most experts agree even the best search engines index only around 10% of the Internet. Many don't even scan the whole Web anymore, but instead restrict themselves to a minute subset. To help ensure your page is "found," you'll want to submit it to the best search services.

Submitting your URL (Universal Resource Locator; a Web address), for potential indexing is a simple task that you can complete in less than five minutes per search site. However, you must handle the job properly if you want to achieve results.

Also be aware that not all search tools are equal. First, you'll find search engines and Web directories, which are two different animals. Second, no matter which category a search service falls into, it probably indexes its content differently than the rest. You'll want to have your site listed with more than one search service, so you'll need to familiarize yourself with how these different categories of search services build their databases. For a list of dos and don'ts for search engines and Web directories, head to our Web site and read our "Submission Tips" sidebar to this article (http://www.smartcomputing.com/guide/jan2001/submitsite).

Search History. The first search engines appeared in the early 1990s, when the explosive growth of the Internet made it obvious that some kind of search tool was necessary. These search engines used Web spiders (or crawlers), which are programs that scan the Internet; examine the contents of the pages they come across; and index them using the words they find in the pages' titles, text in the sites, and other specified criteria. In the early days of search engines, manually submitting Web sites to these services was largely unnecessary because most spiders would pick up a well-designed site within a few weeks.

As the Internet continued to grow, users began complaining that even with a search engine, retrieving the results they wanted was becoming increasingly difficult. In February 1997, Scott Kurnit gathered a team of editors and launched The Mining Company, which was supposed to make locating quality content much easier. The means to do this would be human editors, who had the daunting task of personally reviewing and indexing Web sites. Although the concept drew praise for its attempts at quality control, it came under fire from freedom-of-speech proponents, who questioned the restrictive nature of the system.

Several companies, including Yahoo!, adopted this new indexing model, and Web directories were born. Their developers readily admitted they would not be as extensive as true search engines but asserted the results would be more carefully targeted.

To ward off criticism about exclusionary tactics and to build their databases more rapidly, most Web directories invited the public to submit URLs for review. The requirements for acceptance were clearly defined, so any site that met the criteria could anticipate being indexed. The search engines quickly followed suit (some had already adopted this policy) by allowing users to submit prospective URLs to their spiders.

Getting Listed. How do you determine which search engines and directories you should target, and how can you ensure they index your site? "If you can get a listing on Yahoo!, you should do it, especially if [yours] is a commercial site," says Atlanta-based Web developer Denise Nay. "But there is no

guarantee that they will index it, even if you pay a fee." (Yahoo! allows users to pay a fee that accelerates the review process.) "Web crawlers are a little easier—if you submit your URL to them and follow the rules, [your] chances are good within 30 days you will get indexed."

Nay recommends you restrict your efforts to the top five or 10 search sites. Within this group, you'll find Web directories, such as Yahoo!, MSN, and Netscape, as well as search engines, such as AltaVista, GO.com, Lycos, and Excite. All the top players provide access to both directories and search engines, but the difference lies in how each service handles site submissions.

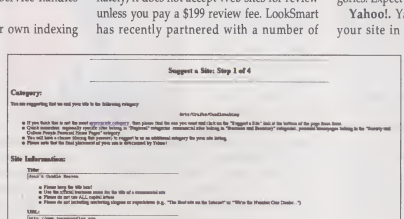
Some search sites do their own indexing and/or Web crawling while others use information from other sources. In the latter case, getting a listing on the external source, such as Inktomi (search engine) or Open Directory (Web directory) will automatically ensure a listing on all its "clients."

AltaVista and Excite. Both search engines have added a LookSmart-powered directory, and will suggest you invest $199 for inclusion in that service (see below). For AltaVista, head to http://www.altavista.com/cgi-bin/query?pg=addurl; for Excite, http://www.excite.com/info/add_url. Scroll down either page to find the instructions to submit your site for free. Both sites used to index submissions within a week, but it remains to be seen if their partnerships with LookSmart will alter that performance.

GO.com. Submission to the Disney-owned GO.com index is free, and the site is specific about its requirements and honest about your chances (lead time is six weeks and GO offers no guarantees). GO also is building a directory, so if you become a GO Guide volunteer reviewer, you can submit your own site. Navigate to http://www.go.com and click the Add A URL link at the bottom of the page to see how the process works.

Inktomi/HotBot. Inktomi, which is the search engine that powers Lycos-owned HotBot, iWon, and Snap and provides backup for MSN, does not accept submissions directly. To submit your URL to Inktomi, you'll need to go to the HotBot submission page (http://www.hotbot.com/addurl.asp). At the bottom of this page, you also will find instructions for submitting to the HotBot Directory. (You'll actually be submitting to Open Directory, which both HotBot and Lycos use; see below for more information.) Indexing takes from three to 60 days.

LookSmart Directory. The LookSmart Directory, which powers MSN and provides backup for AltaVista, Excite, and others, claims to reach 77% of Web surfers. Unfortunately, it does not accept Web sites for review unless you pay a $199 review fee. LookSmart has recently partnered with a number of



Yahoo! and other Web directories let users suggest sites that content editors will review and index into appropriate categories.

search engines, and paying the fee gets you reviewed for inclusion in the directory, as well as in the indexes of its search engine partners, within 48 hours. Go to http://www.looksmart.com and click the Submit A Site Link at the bottom of the page to get started.

Lycos. Submitting a site to Lycos is as painless as possible. Go to http://www.lycos.com/addasite.html, type in your site's URL and your e-mail address, click the Add Site To Lycos button, and wait two to three weeks for your site to be indexed. Lycos has recently added a Web directory, but the service's spider indexes new sites in its search engine.

Netscape/Open Directory. Netscape's primary search vehicle is its own Open Directory although it allows users the option of searching AltaVista, Google, HotBot, and others. To get listed on Netscape, you'll need to get listed on Open Directory.

Open Directory (http://www.dmoz.org), which powers Netscape, AOL Search, Lycos, Google, and others, aims to be the largest database of content-reviewed Web sites on the Internet (it boasts thousands of volunteer editors). It works in identical fashion to Yahoo! (see below), except the Add URL submission link is located at the top of the category listings. Like Yahoo!, you cannot suggest sites for top-level categories, only for their subcategories. Expect a wait of about three weeks.

Yahoo!. Yahoo! requires that you submit your site in a specific category, so go to Yahoo!'s home page (http://www.yahoo.com) and choose the one in which you think it belongs. Next, click the How To Suggest A Site link at the bottom of the page. Yahoo! requires you to provide the URL, a brief site description, and your contact information. Because of the volume of submissions, it can take months for your site to be reviewed, if it happens at all. However, if your site is commercial and you want to guarantee review within seven days, you can shell out $199 to expedite the process.

If you're thinking about using one of those fee-based services that promise to submit your site to 400 search engines, Nay says to forget about them. "If you're indexed with the big guys, then you've covered 90% of Web searches." Instead, she suggests spending your spare time monitoring your listings. If your Web site changes, you can resubmit it (in the case of search engines) or update it (in the case of directories). Lastly, if you can't pull up your listing using a search engine, you should resubmit it. "Spiders revisit their indexed pages periodically, and if there is a problem with your site, they will drop it," Nay says. "The last thing you want is to lose your spot in AltaVista while you're out chasing a listing in some obscure portal." 6S

by Jennifer Farwell

Create A Higher Profile

Boost Your Site's Place In Search Engine Rankings

Getting your site noticed on the Web is a two-step process. Assuming you've submitted your Web site to a couple major search engines and they have indexed it, you can now go to those sites, type in your keywords, and your URL (Universal Resource Locator; a Web address) will be returned as one of the listings. The only problem is that your site is returned as listing No. 97 out of 100 matches. Your second step is to get your site moved up on that list of matches.

Considering the number of Web sites that search engines and **Web directories** (the "human-powered" search sites, where content editors review and categorize each site) index, being No. 97 is actually fairly good. We can remember occasions when a search returned thousands of rankings; for one search, we used two common keywords ("Web" and "addressing") and got a return of 1,440,000 possible matches.

However, because many users never make it past the "top 10 matches" that most search engines display by default, there is little point in being No. 900,000, No. 9,000, or even No. 900. If you want the maximum number of interested searchers to get your Web site as a match, you need it to appear in the top-10 list for at least one search string.

■ **Make A Match.** Search engines, like most commercial Web sites, are owned by companies that hope to make money from them. In order to be profitable, these companies have to convince someone, usually an advertiser, to pay them.

The search site GoTo (http://www.goto.com) has adopted a "pay for placement" model that most search site developers hate. These developers say people consider search engines objective information sources, and accepting payment for guaranteed placement compromises the objectivity and trustworthiness of the listing, just as it would for a newspaper or a television news program.

GoTo representatives counter this argument by using the Yellow Pages as an example. Businesses can be listed in the White Pages (in terms of this comparison the White Pages represents other search engines) at no charge, but a listing in the Yellow Pages costs money. Consumers still trust the Yellow Pages, right? However, the difference is that the White Pages is also available as an option. To validate this argument, GoTo would have to offer two search options, which it does not.

Although this argument may carry more weight in the future, for now, the general consensus among other search sites is "no payment for placement." You can, however, pay to get your site reviewed quicker, and many search sites are considering other payment models, such as "pay for click-through," whereby a company pays every time a search site refers someone to its site.

In the meantime, search sites are in a mad dash to gain as many loyal followers as possible, with the intention of selling banner ads and menus of "preferred" or "recommended" listings that pop up when someone uses related search strings. In order to gain a loyal following, these services must return relevant, content-rich matches for searches, not just a motley collection of Web sites that happen to share a keyword. When a user searches by the exact phrase, "Waldorf Astoria," for example, he or she anticipates that the Web site of the landmark New York hotel The Waldorf=Astoria will be returned, along with Web sites that contain information about The Waldorf=Astoria.

To fulfill these user expectations, search engines and directories strive to ensure the sites that best fit the criteria for a match will appear first in the rankings. To accomplish this task, directories have editors whose job it is to evaluate the worthiness of a site's content in relation to the category under which it is classified. Search engine developers program criteria into their **spiders** (programs that find and index Web pages), such as the words used in the title, to help the software evaluate the applicability of a Web site to a particular search string.

Some search sites, in particular Direct Hit (http://www.directhit.com), return matches ranked by popularity; that is, the number of people that visited a particular site after it was returned in a search string. Direct Hit listings now pop up on a number of search sites, so if you think you have a chance of winning the popularity contest in a certain area, go ahead and submit your site at http://www.directhit.com/util/addurl.html.

■ **State Your Rank.** So exactly what can you do to ensure your Web site fits the criteria needed for a good rank? In the case of directories, your best bet is to peruse the tips given on each site. The top two directories are Yahoo! and Open Directory. In addition, a good ranking on Open Directory will automatically mean you'll be a player on the directories of its clients, which include Netscape, AOL Search, and Lycos. Both Yahoo! and Open Directory allow you to notify them of updates to your site; that way, if they have indexed your site but you don't like your ranking, you can tweak your site to make it more interesting, interactive, and user-friendly and then resubmit it.

In the case of search engines, the key won't be what is *on* your site as much as what is *in* it, meaning the structure of the site, as well as the wording of your HTML (Hypertext Markup Language). We asked Danny Sullivan, originator of the extensive search engine-related Web site, Search Engine Watch (http://www.searchenginewatch.com), to provide us with tips to get your site ranked higher. Sullivan has been writing about search engines since

1995 and is widely considered to be a foremost authority on how they operate.

(NOTE: Sullivan's own version of his list is available on the site, along with other ranking-improvement strategies and interesting facts about search engines. If you subscribe to his service [$79 per year], you'll get even more pertinent information.)

Pick strategic keywords. When a spider crawls your site, it looks for frequently repeated words that become your keywords. Make sure these match the words you want people to use to find your site. For example, if your site deals with candle making, your main keyword would be candle making or maybe candle-making.

Other related words, such as wax and wick, would be important as well, but you would want to use that one term, candle making, frequently and in the proper context. Be sure to make your keywords as specific as possible; if your site deals mainly with Colonial candle-making techniques, repeat that phrase. Colonial candle making is a much smaller category than candles or candle making, and you'll have fewer sites to compete against.

Position your keywords. Once you've chosen your keywords, put them in the right place. The page title is critical; failing to put your keywords there can destroy your ranking. Also, repeat the keywords in the headline and the first few paragraphs of text. The earlier your keywords appear, the more important they will seem to the spider.

Have relevant content. Make sure those keywords appear in the HTML content, not just on the page. For example, if your headline is a graphic, putting your keywords there won't help you because a spider won't see them as words.

Tables also can cause problems because a spider breaks tables into consecutive blocks (column one followed by column two, etc.). As a result, a keyword placed in row five of column one will appear to a spider before one in row one of column two. You can use tables, just make sure your keywords appear in HTML text in front of them.

Avoid search engine "stumbling blocks." Most search engines are much less sophisticated than newer browsers. Many can't read frames, image maps (graphics with links to other pages), and JavaScript. To be safe, keep your keywords in the HTML code of your site and make sure you provide HTML hyperlinks that spiders can use to find your other pages. If frames are an integral part of your site and its navigation, make sure to include a no-frames version that spiders and users with older browsers can follow.

Avoid dynamic doorblocks. Some Web sites use dynamic HTML or CGI (common gateway interface) scripts to generate customized pages that match their viewers' characteristics, such as their geographic locations or the previous pages they've visited. Dynamic HTML is cool, but many spiders don't read it and can't enter pages generated with it. Static HTML is your best bet for successful indexing.

Use meta tags. Most spiders use meta tags, which are special HTML tags that provide information about a Web page (such as its keywords, page creator, and content), to index sites. Use them religiously because they are invaluable in your quest for better rankings. For more information about meta tags and how they work, see "Learn To Use Meta Tags On Your Site" in this issue.

Pass on the spam. Spamming, which in this case refers to the practice of repeating keywords purely to increase their frequency, is unethical and can backfire because some spiders are programmed to detect the use of unreferenced keywords. Don't use keywords to build little frames around your text, and don't repeat your keyword over and over again in the same color as the background so it is invisible to users but shows up to spiders. Not only will most spiders not index those words but many will also throw you out of the database if they come across them.

Once you've completed your tweaking, sit back and wait a few weeks to see what happens. If you're still unhappy with the results, consider changing your keywords and submitting your site again. As we mentioned earlier, specific keywords have a much better chance of improving your ranking.

There is an old marketing adage that says, "I'd rather mail my brochure to 100 people that will buy my product than a million who won't." The same is true of search engine rankings. The Colonial candle-making aficionado in our example is much better off with a No. 4 rank among the few thousand who search under that exact phrase than with a No. 2,000 rank among the millions of people who like candles. GS

by Jennifer Farwell

Figure 1

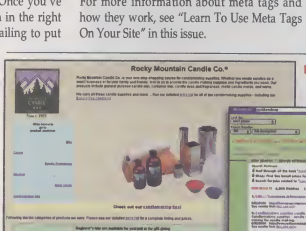


Figure 2

A search for "candlemaking" with HotBot returned thousands of listings, with Rocky Mountain Candle Co. coming up No. 2 (Figure 2). On Rocky Mountain's site, the "candlemaking" keyword occurs throughout the text (Figure 1). The site's creators also made sure "candlemaking" showed up in the site's HTML code (Figure 3).

Learn To Use Meta Tags On Your Site

Give Search Engines Something To Look For

After you go to the trouble of creating a Web site, you want people to come and see it. One of the easiest and most likely ways people will find your site is by stumbling across it in a search engine. How can you ensure your site isn't buried deep in the search results and that it looks nice? One simple solution is to use a title and meta tags on your Web pages.

■ **Meta Tags Defined.** Meta tags are HTML (Hypertext Markup Language; the language used to create Web pages) tags that don't affect the way the page is displayed. They work behind the scenes to provide important information about the page, such as when it was last updated, who created it, what it is about, and what keywords represent it. Search engines use this information to match keywords in a search to keywords in a Web page.

Together with a page's title, meta tags are one of the key ways to promote your site in a search engine. It simply isn't good enough for your site to be listed in a search engine's results list; it must appear near the top of the list, or users may not find it. You should aim to get your site into the first or second results page.

Unfortunately, every search engine uses title and meta tag data differently, so there is no right or wrong way to create them, making meta tagging an inexact science. There are, however, some meta tag guidelines you should follow, and we'll look at these. There are also simple ways you can check to see how your meta tags are working and, if they aren't, alter them so your site will appear where it should on a search results page.

■ **The Key Meta Tags.** There are two key meta tags that you should use on every page of your site. The first tag describes your site, and the second tag contains the keywords that represent the content on your site.

In pure HTML terms, these are easy to create. The description meta tag for a site belonging to someone interested in San Francisco Painted Ladies (the beautiful Victorian houses so prolific in that city) might look like this:

<META NAME="description" CONTENT="Painted Ladies. The beautiful Victorian houses of San Francisco. A graphical journey showing the architecture of the Victorian era.">

While most search engines use the page's title as the title that will appear in the search engine results, many search engines, such as AltaVista and HotBot, also include the description text as the site's description. For this reason, be sure to include a description meta tag on your site so that it is described to your liking. If you don't include this tag, many search engines will simply display the first few words of the document, which is usually totally meaningless. The result is that you have passed up a very simple opportunity to advertise your site.

Keep in mind that your site description should be short. At the time of this writing, AltaVista was displaying only the first 140 or so characters of the site description, so keep it succinct and place the key information early in the description in case it is cut short.

The second key meta tag is the tag that contains important keywords on your page. These words are what a search engine uses to determine what the page is about, and they give you another way to make sure visitors can find your site. This is a sample keyword list for our hypothetical Painted Ladies site:

<META NAME="keywords" CONTENT="painted ladies,san francisco,sf,victorian architecture,ornate,houses,buildings,historical,antique,america">

Both the keyword and the description meta tags should be placed in the Head area of the HTML document. They can be the same on every page, but it would be better still to tailor them to suit each page. If you write separate meta tags for every page of your site, you'll increase the chances of someone finding your site, because you'll be able to use a larger mix of keywords and descriptions.

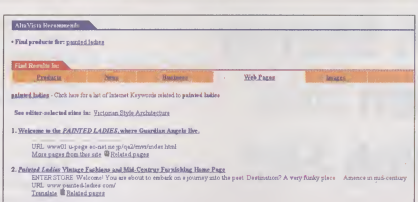
■ **Creating Keywords.** Cast your net wide when creating a list of keywords; include everything that is relevant to your site. In your keyword list should be any words that a typical user might type into a search engine if they were looking for information your page can offer. If you're still unsure of what

keywords to use, sit down with a friend and ask her to search for sites like yours using a search engine. Take note of the words she uses to search and add them to your keyword list. Remember the point is not for you to show her how to find your site (so don't prompt her), but rather for her to show you how a typical user might try and locate it.

You should consider including abbreviations and acronyms as well as the fully spelled out versions of words because users will likely use both. Also include synonyms of obvious keywords. If this is unfamiliar territory for you, pull out a Thesaurus and check for any words that you may have overlooked.

Make sure that the words you use as keywords are correctly spelled, but also consider including the incorrect spellings of keywords if users are likely to misspell them.

Another place to look for keywords is your own server log files. If your server provides you with a Keywords report, you'll find it contains details of the keywords that users have actually used. This will give you an indication of keywords that are popular amongst your visitors, which you should include in your list if they aren't there already.


AltaVista Recommends:
• Find products for: painted ladies
Find Results for
Products
News
Businesses
Web Pages
Images
painted ladies - Click here for a list of Internet Keywords related to painted ladies
See editor-selected sites for: Victorian Style Architecture
1. Welcome to the PAINTED LADIES, where Guardian Angels live.
URL: www01.u-page.so-net.ne.jp/ca2/mwm/index.html
More pages from this site Related pages
2. Painted Ladies Vintage Fashions and Mid-Century Furnishing Home Page
ENTER STORE Welcome! You are about to embark on a journey into the past. Destination? A very funky place Americ in mid-century
URL: www.paintedladies.com/
Translate Related pages
3. The Painted Ladies
The Painted Ladies Americ's resplendent Victorians
URL: www.paintedladies.com/
Translate More pages from this site Related pages Facts about Lauren & Pamela

You want your site to appear near the top of a search engine's results list and to display a neat and intelligent title and description.

■ **Include A Summary.** Unfortunately, while most search engines will probably index the text in your meta tags, ensuring your site a higher place in search engine results, not all search engines (Google included) use the meta tag data to display your site.

Search engines, such as Google, bypass the description and instead display the first text they find on your Web site in the search engine results. It's therefore wise to include a short summary paragraph as the first text to appear on your Web page. While this might not appeal to your design aesthetics, and it will probably require some reorganizing of the content on your page, the result can mean the difference between an informative entry in a search engine's results and pure gibberish.

■ **Don't Overlook The Title.** When you're adding meta tags to your site, also ensure that every page on the site has a title. This is because most search engines display the title of the page as the first line of a search result. If you don't have a title, the search results that represent your site will say "No Title," and you'll have wasted another opportunity to attract visitors to your site.

The title is also important in that many search engines index the title along with the meta tag text. You should therefore make the title meaningful and descriptive of your site and include in it keywords that describe your site. This will enhance the chances of your page being returned on a visitor's search.

■ **If You Use Them, They Will Come.** Don't put a lot of work into your site only to have it overlooked by search engines because you forgot to include meaningful meta tags. Use these simple HTML tools as a neon sign to direct traffic to your site.

by Helen Bradley

Meta Tagging Tips

Check Your Ranking. Don't be afraid to tweak the content of your meta tags as needed to improve your position in search engine results. You should periodically see how you rank in some of the top search engines so you can correct problem areas and continue with areas that seem to be working. To check your standings, visit a search engine and type in a keyword that should match your site to see how close to the top of the results your site appears.

Some Web sites, such as Top-10 promotions (http://www.top-10.com) and did-it.com (http://www.did-it.com) will do this for you for free. If you're not in the top 30 to 50 results, take a critical look at your keywords and adjust them to see if you can improve the results.

Check Out The Competition's Keywords. If you're stuck for keywords, take a look at the keywords that your competition is using. Visit their Web sites. In Netscape Navigator, choose View, Page Source. In Internet Explorer, choose View, Source. In each instance a new window will open that shows the page's HTML (Hypertext Markup Language). The meta tags will be at the very top of the document.

Remember that using another site's keywords word for word is theft. However, viewing the page and using what you learn from it to build your own list of keywords is simply good sense.

Increase The Repetition Of Keywords. Some search engines look for the number of times a keyword appears on your site to determine its relevance. The theory is that the more times the word appears, the more relevant it is. However, this is countered by the practicalities of spamming: When you repeat keywords too many times, you run the risk of your site being banned or overlooked by search engines that are trying to block spammers. The ideal is to find a compromise between these two extremes and ensure that your keywords appear regularly throughout the relevant page. In addition to using them in your text, you can add them to the ALT tags on your images and include them inside comment tags.

Build A Search Function Into Your Web Site

Help Users Find What They Want So They'll Come Back For More

Search engines help people find things on the Web. There are lots of them around; some of the most popular ones include sites such as AltaVista, Google, and Excite. In addition to these search engines that search the whole Web, there are search functions that look for information on just one site. These search functions help users find what they came to the site for. We'll take a close look at these search functions, helping you decide if you need one and showing you how to create one on your site.

■ **Why Add A Search Function?** There are many reasons for adding a search function to your site, and it's easy to recognize them when you put yourself in a visitor's position. After all, an informed visitor is a happy visitor, so if you want to keep people coming back to your site, make sure it has helpful search capabilities. In fact, you should give as much consideration to the search function of your site as the content on your site. The content is only of value to visitors if they can find it.

In most cases, visitors are viewing your site because they are looking for something in particular. They may not find it quickly enough using the navigation system you have in place and, if they can't locate the information, they'll become frustrated. They may even quit visiting your site altogether. Instead of wading unsuccessfully through your site, they'll visit another site in the hopes of finding there what they couldn't find at your site.

A good navigation system is not enough. While creating a good navigation system will be sufficient help for many people, it won't meet the needs of everyone. You simply don't know what your visitors will come to your site looking for. All you can do is put as many tools as you can at their disposal to make it as easy as possible for them to find what they are looking for or to assure themselves that what they are looking for can't be found at your site.

Used together, a helpful search function and clear navigation system will steer your visitors in the right direction, encouraging them to come back for more.

You can't rely on the big engines. Many site managers make the mistake of thinking that they don't need a search function on their site because users can employ a large search engine such as Google or AltaVista to look for information. The problem is that many users consult a large search engine to find a site, and once they get to that site, they need to search on a more local basis. You need to provide the resources for them to do so.

When you add your own search function to your site, all the results users see match pages on your site. This encourages your visitors to remain on your site and may even interest them in something they weren't originally looking for. You will also benefit by being able to look at the words and phrases visitors use to search your site. Use this information to learn more about why people visit your site and what they look for. This will help you enhance the popular areas of your site and identify those areas that need improvement.

Many visitors will look for the search button. Another reason why a search function is important to your site has to do with the way users act on a site. Usability expert Jakob Nielsen has studied how people search for many years, and he has determined, among other things, that some people are what he calls search-dominant while others are link-dominant. Search-dominant users look for a search button as soon as they visit a Web site. They aren't interested in looking around on their own. Link-dominant users will typically look around a little longer on their own before they use the search function.

Nielsen recommends that Web sites with more than 200 pages offer a search button on every page.

Some search functions are quick and easy to set up, and you can usually get them from companies for free in exchange for letting them place advertisements on your search tool's results page.

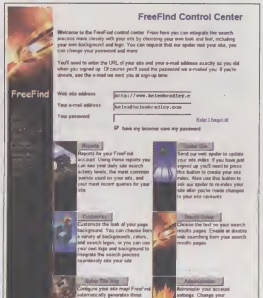
■ **The Elements Of A Search Engine.** Regardless of what type of search function you use, they all work similarly and comprise a few key parts. The first key part is the search form. This is usually a text box where visitors type the word or phrase they wish to find and a search button they click when ready to search. Another key part of a search function is an index of the site that contains the words and phrases used on the site.

When the user clicks the search button or presses ENTER after typing in a word or phrase, the search program, or script, compares the user's words to the words in the site's index to find matching pages. Matching pages are pages on which the search words appear. Finally, these pages are displayed for the visitor on a results page. The results are often arranged in order by date or confidence level, which indicates the likelihood that what the visitor is looking for can be found on that page.

The good news for you is that you don't have to reinvent the technology of a search function for your site. Much of the work has already been done for you; you can simply add one to your site. You have a choice too. You can choose to add a search function that will search just the pages of your site or a function that will search the entire Web from your site.

■ **Things To Consider.** There are some very important key points to consider when you are evaluating options for adding a search to your World Wide Web site. For example, you probably want to make your search function as easy to set up as possible. Some search functions are quick and easy to set up, and you can usually get them from companies for free in exchange for letting them place advertisements on your search tool's results page. To get a more personalized and free solution will take more work on your part and will generally require more skill.

Getting technical. Technology is another factor to consider as some search functions require specific technology. For example, **CGI (common gateway interface)** scripting solutions, the standard for passing information between a server and an application as part of the Web's HTTP protocol, are limited to specific server types. Further, the search form of Microsoft's FrontPage (software that helps users create and manage Web sites) will only work if your site has the necessary FrontPage Server Extensions (programs on a Web server that give you control over a FrontPage-based Web site).



From the FreeFind Control Center, you can customize your search function, read user reports, and more.

Set up and maintenance. If time is a factor, you may choose to use a search service that does the work of setting up a search function for you. Most search services can have your new search function up and running in a few minutes, which is better than spending your own time setting up a search function and then debugging it and making sure it works.

Along those lines, ongoing maintenance is another factor to consider. Once you've established a search function, you have to continually update the index as pages are added and removed from your site. It may save you a lot of time and hassle to implement a search solution that can periodically reindex your site for you.

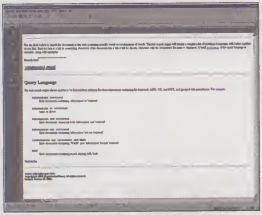
Make it yours. Consider also how much you can customize your search function. You'll want it to look, as much as possible, like it belongs to your site, so you'll want to be able to adapt its look to that of the remainder of your site. The services that set up a search function for you for free are less customizable than the scripts solutions such as CGI. You may also want to customize the way your search function displays the results. You can do this more easily with a scripts program that you implement yourself than with a search function that is hosted by someone else.

■ **Preparing Your Site.** Before you get your search function up and running, you'll need to determine where to put it. The sensible thing is to add search capabilities to every page of your site. Because you can't determine where your visitors will be when they need to perform a search, you should make it accessible from everywhere, including your home page.

Before you index your site, you should make sure all your links are working, as broken links can prevent the site from being fully indexed. It will also help if you duplicate any image links so they appear on your site as text links. This goes for links that are buried within image maps, as well.

You should spell check your site if you haven't done so recently to ensure that your site doesn't contain any embarrassing mistakes. Make sure that, where possible, each

page of your site has a title and a meta tag with the page description entered in it. (Read more about meta tags in "Learn To Use Meta Tags On Your Site: Give Search Engines Something To Look For" on page 136.) Many search functions return pages in a list by title and description. If your pages don't have titles and descriptions, they won't look particularly good in the search results of either your own search function or a search function of the entire Web.



Provided your site has FrontPage Server Extensions, you can add a search page that lets visitors search your site.

■ **Search Function Options.** You have several options for what search function you add to your site. We have included some of them here.

Your ISP. It's easy to overlook your ISP (Internet service provider) as a source of added features such as search functions, but many of them do offer these resources. This is a workable alternative if your ISP discourages the use of scripts. (We talk about these later.) Ask your ISP or check their Web site to see if this is an option available to you. Because each ISP will differ in what it offers, you'll need to obtain instructions specific to your ISP's search.

FreeFind. FreeFind offers a free site search service that promises to have you up and running very quickly. To add a FreeFind search to your site, visit http://www.freefind.com and enter the required information. FreeFind will ask you for the address of your Web site, your e-mail address, and your site's category (such as business or entertainment). Then just click the Instant Sign-up button, and FreeFind will send your password and the HTML information you need to your e-mail account.

When you have your password, return to the site to arrange to have your site indexed. To do this, go to the Control Center, enter your new password, and click the Spider Site button. The spider will then access your site and create an index of the words used on it. The spider also builds a site map of your site and generates a What's New page for you. These help your visitors find their way around your site and quickly discover what's new on your site since they last visited. You'll receive another e-mail when this process is complete.

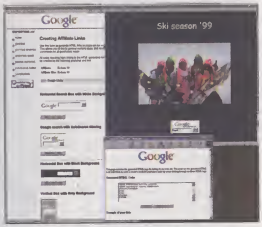
In the meantime, you can continue working on your site with the HTML information you received with your password. Simply copy and paste the code from the e-mail into your site. You can add a panel that lets your visitors search just your site, the entire Web, or both your site and the entire Web. You can also add code for your Site Map, your What's New page, and simple text-only links for your search. Add the code you want to use to the pages of your site using a text editor.

From the Control Center, you can customize the FreeFind search to match the look and feel of the rest of your site. The site also offers a report so you can see what visitors to your site have been searching for. Use these reports to better design your site to meet their needs. For example, if visitors are looking for something you don't provide, you should look at how you're presenting yourself to them in search engines and elsewhere and make sure the purpose and content of your site is clearly explained so they can assess quickly how useful your site will be to them.

FrontPage. If your Web server has the FrontPage Server Extensions, you can use FrontPage to add a search function to your site. To do so, choose New, Page from the File menu on your Home page. From the General tab, select the Search Page option and click OK. Select File, Save As; name the page Search.htm; and click Save. Click the Navigation button on the left of the screen and, from the Folder List, drag the file Search.htm into position within your site's hierarchy. Until you do this your search page will be an orphan page not linked to anything else.

Depending on what type of navigation structure you have in place, including whether you maintain it manually or FrontPage manages it for you, you may also need to provide links to the search page on other pages of your site so it can be readily accessed.

FrontPage's search template creates a fully functional search form that includes



Google offers several choices of search boxes that you can add to your site. Pick the one you want, and Google generates the necessary code for you.

help information for your visitors. You could leave this form as it is, but it is pretty ugly, so you'll probably want to edit it using your FrontPage tools. In this way, you can make it match the layout and design of the remainder of your site.

You can preview the page in FrontPage's Preview option and in your browser. However, because the Search option uses the FrontPage Extensions, you won't be able

It's easy to overlook your Internet service provider as a source of added features such as search functions, but many of them do offer these resources.

If you don't make this search easy for your visitors, they may not come back, and your site won't be as successful as you'd like.

to test the page until you publish it to a server that has the Extensions available. An alternative to a fully featured search page, and one that also requires the FrontPage Server Extensions to be installed, is FrontPage's Search Form option. Instead of a dedicated search page, you can add a small search form to any page on your site. To do this, position the cursor where the form will appear; choose Insert, Component, Search Form; and click OK to accept FrontPage's default settings. In this case, you'll have to create the explanatory text yourself so your visitors will know how to use the search box.

Whenever you save a page to your Web site, FrontPage will automatically add any new words to your site's search index so the contents of each new page will be included in your site search. Unfortunately, if you remove pages, FrontPage won't automatically delete those words from the search index. You'll need to create a new index (to remove unused words) by choosing Tools, Recalculate Hyperlinks. This process also verifies external hyperlinks, so it may take a little time.

CGI script. An alternative to using a free service such as FreeFind that is useful if you can't use FrontPage because you don't have the appropriate Server Extensions is to use a CGI script to add a site search. There are innumerable sources of scripts on the Web; one of the best is Matt's Script Archive (http://worldwidemart.com/scripts). Here you'll find a free search script that you can add to your site. You can also browse through setup instructions, FAQs, and sample sites to see the script at work.

A word of warning about CGI scripts: They're not for beginners. They do take some effort to set up, and you will want to have a good relationship with your Web hosting service, because if things go wrong or don't work as expected, you may need to ask them to help you troubleshoot.

You will need permission from your Web hosting service to run scripts on their server, because badly written scripts can cause problems on the server. Further, your hosting service may need to set up special directories or give you access to special directories on the server to place the scripts in.

Links To External Search Engines. In addition to adding a search function that will search your site, you can add a function that will let visitors search the whole Web from your site. Most Web-wide search engines have programs that let you add their search functions to your site. We looked at one such program.

Scripting sites such as Matt's Script Archive are a good source of CGI scripts for site search functions and the instructions you'll need to get them up and running.

Google. The effective search engine Google offers a program called Google WebSearch (http://www.google.com/websearch_programs.html) that lets users who visit your site search the entire Web from your site using Google's search technology. You don't need any special hardware or software to add this Google WebSearch to your site. You simply choose which program is right for your Web site (Google offers five of them) and follow the setup steps.

The Affiliate Program is one of the five choices. It costs you nothing, but Google will place ads on your site to pay for the service. You will receive one cent for every search your visitors perform using Google's service, and you will also have access to online reports of your visitor's search activities. The search results will be displayed on Google's site instead of your site.

The Google Affiliate Program is designed for small- to medium-sized Web sites. To become an affiliate, simply fill out an online application. Generally, only those sites with objectionable content will be denied. Once you're approved, you are given a password that gives you access to a manual that will tell you how to set up the program on your site.

You'll then go to the Creating Links section, which displays a range of different Google search boxes you can choose from. You'll want to choose one that will look good on your site. When you find it, click the Make My Code button, and the code for the search box will be created automatically for you. You then copy the HTML code and paste it into your Web page at the place where you want the link to be displayed. Upload the page to your ISP, and your Google search will be functional. If you decide later on that you don't want to offer the search anymore, you can remove it by simply removing the code from your site.

The Search Has It All. People are busy. When they visit your site, they want to find what they're looking for, and they want to find it NOW. If you don't make searching for information easy for your visitors, they may not come back, and your site won't be as successful as you'd like. So give them what they want: a fast, easy, and effective search that will keep them coming back for more. GS

by Helen Bradley

INDEX

Article titles are in bold type.

A

A Closer Look At Linux, The Operating System That Could, 55
A Method To The Madness: Understanding The Web's Organization Makes It Easier to Find What You Want, 103-106
Acer WL-172 Wireless Keyboard, 12
Advanced Technology Attachment Program Interface, (ATAPI), 49
Advanced Technology Attachment, (ATA), 49
Affordable Gadgets & Accessories: These Tools May Not Be Necessary, But They Make Computing More Fun, 16-18
Aiptek HyperPen 8000, 11
AltaVista, 111, 126, 133
AltaVista: Put This Engine To Work For You, 126
Altec Lansing ATP3 3-Piece System, 13
America Online: A Wealth Of Information For Nonmembers, Too, 129
American National Standards Institute, (ANSI), 49
ANSI. *See American National Standards Institute.*
Apache Web server, 62
Apollo P-2150U, 33
Archie (Archives Program), 103
Armed Linus Workstation beta 1.1, 64
Artstream, 92
Ask Jeeves, 111
Ask Jeeves: Straight From The Butler To You, 127
ATA. *See Advanced Technology Attachment.*
ATAPI. *See Advanced Technology Attachment Program Interface.*
Autoweb, 117
Awesome Library, 115

B

Basic Input/Output System (BIOS), 71
BIOS. *See Basic Input/Output System.*
Boolean logic, 119
Boolean Operators, 105, 124
Build A Search Function Into Your Web Site: Help Users Find What They Want So They'll Come Back For More, 138-141
BullsEye Pro, Intelliseek, 131
BullsEye2, Intelliseek, 131

C

Caldera Linux Technology Preview, 64
Cameras, 21, 25, 28, 32, 33, 36, 43, 45, 46
Canon BJC-2100 Color Bubble Jet Printer, 10, 36
Canon BJC-3000 Color Bubble Jet Printer, 19
Car Times, 117
Casio BZX20 PC Unite Watch, 17
Casio Cassiopeia EM-500, 19
CCD. *See charge-coupled device.*
CD-R. *See CD-recordable.*
CD-recordable (CD-R), 25
CD-rewriteable (CD-RW), 25
CD-RW. *See CD-rewriteable.*
CGI script, 141
CGI. *See common gateway interface.*
Charge-coupled device (CCD), 28
CM228 Universal Multi Angle Palm-Sized Computer Kit, Arkon Resources, 9
CMOS. *See complimentary metal oxide semiconductor.*
Cobalt's Qube 3, 6
Command queuing, 53
Common gateway interface (CGI), 139
Complimentary metal oxide semiconductor (CMOS), 28
Copernic 2000 (standard, Plus, and Pro versions), Copernic, 131
CorelDRAW, 93
CPU architectures, 68
CRC. *See cyclic redundancy check.*
Create A Higher Profile: Boost Your Site's Place In Search Engine Rankings, 134-135
Creative Labs Blaster Webcam 3, 13
Crime Spider, 114
CueCat Reader, 18
Customize Your Linux Desktop: The Terminal Window & Graphical Interface Offer All The Power You Need, 82-83
Cyberscheduler, 92
Cyclic redundancy check, (CRC), 53

D

Daemon, 62
Debian GNU/Linus 2.2, 64
DEFCON 1 notebook security alarm, Targus, 9
Desktop systems, 20, 30
Diald, 85
Digital camera, 8-9, 21, 25, 32, 36
Digital tablets, 28
Direct Hit, 111, 128
Directhit.com, 134
D-link, 67
DLX, 64
Doctor Directory, 115
DogPile, 112, 120
Downloads, 96-97
Driver, 74
Dual-Boot issues, 90, 91
Dual-boot, 74
Duplexing, 37
Dye sublimation printer, 37

E

Education World, 115
EIDE vs. SCSI: Performance & Price Determine How Much You Need Speed, 49-54
EIDE. *See Enhanced Integrated Drive Electronics.*
Enhanced Integrated Drive Electronics, (EIDE), 49
Epson Stylus Color 777, 10
Excite, 112, 125, 133
Excite: Rev Up Your Search With This Engine, 125

F

FAST Search, 112
FedWorld, 115
Firewalls, 67, 94
Flight Sim Yoke PC, 12
Foreign Word, 116
FreeFind, 140
FrontPage, 140
Frontpath's ProGear, 66

G

Games, 95, 97
Gateway Guardian, 94
Gateway Solo 1150cl, 38
Get Your Site Noticed: Let Search Engines & Web Directories Help Surfers Find You, 132-133
Getting Around In Linux: A Look At Two Graphical User Interfaces, 80-81
GIMP. *See GNU Image Manipulation Program.*
GNOME. *See GNU Network Object Model Environment.*
GNU General Public License, 60
GNU Image Manipulation Program (GIMP), 61, 73
GNU Network Object Model Environment (GNOME), 61, 80, 81, 82
Go Mobile For Less Than $100: Cheap Options To Enhance Your Life On The Go, 7-9
GO.com, 133
Go/Infoseek, 112
go'trieve, BIAP Systems, 130, 131
go'trieve Pro, BIAP Systems, 131
Goldin, Jeff, 88-91
Google, 112, 128, 141
Google: You'll Go Gaga Over This Engine's Speed, 128
GoTo.com, 113, 134
GovConnect, 115
goVox digital recorder, LandWare, 8
Graphical user interface (GUI), 56,

80, 81
Graphics cards, 24, 40, 43
GUI. *See graphical user interface.*

H

Handheld, 21
Hard drives, 29
Hardware Less Than $100, 6
Hardware, 97
Health Link USA, 115
Hercules 3D Prophet II GTS, Hercules, 43
Hewlett-Packard OmniBook 900, 48
Hewlett-Packard Pavilion 8760C, 20
Hewlett-Packard PhotoSmart 1218, 37
Hewlett-Packard PhotoSmart 618, 43
HotBot, 113, 133
HP ScanJet 4300Cse, 46
HP ScanJet 5370Cse, 33
HTML. *See Hypertext Markup Language.*
Hypertext Markup Language (HTML), 118, 136, 137

I

IBM InfoPrint 12, 47
IBM InfoPrint 21, 24
IBM NetVista All-In-One X40i, 30
IBM P96, 41
IDE. *See Integrated Drive Electronics.*
I-JAM IJ-50, 8
ImageMate USB, SanDisk, 9
Inexpensive Peripherals: Outfit Your Computer For Under $100, 10-13
InfoSpace, 119, 120
Inkjet printers, 10
Inktomi, 133
Input devices, 7, 11,12, 23, 26, 28, 33, 46
Installing Red Hat Linux 7: Preparation Is Essential To Success, 76-79
Integrated Drive Electronics, (IDE), 49
Intel Easy PC Camera, 28
Intel Pocket PC Camera, 21
Internet Service Provider, (ISP), 140
Internet, 103-106
Intrigo Lapstation, 16
Iomega External Zip 100MB USB Drive, 11
iREZ KritterUSB, 9, 45
ISP. *See Internet service provider.*
ixquick, 121

J

Job Search Engine, 117
Jumpers, 89

K

K Desktop Environment (KDE), 61, 80, 81
Kaspersky's Anti-Virus (AVP) For Linux Workstation, 93
KB Gear JamCam 3.0, 9
KDE, 83
KDE. *See K Desktop Environment.*
Kernel, 63
Keyspan Digital Media Remote, 18
Kodak DC4800, 32
Kodak DC5000, 46
Kodak DVC325, 9

L

Labtec Axis-2000 headset, 8
Laser printer, 23, 24, 34
Law Guru, 117
Learn To Use Meta Tags On Your Site: Give Search Engines Something To Look For, 136-137
Lexmark Optra E312, 29
Lexmark Z32 Color Jetprinter, 10
LILO. *See Linux Loader.*
Linux Hardware: The Platforms That Make Linux Tick, 66-67
Linux Loader (LILO), 62, 89
Linux Online, 91
Linux Online: Get The Help & Information You Need From These Online Resources, 96-99
Linux PPC 2000, 64
Linux, 55, 56-59, 60-62, 68-69,70, 80-81, 96-99, 100-101; components, 60-61; commands, 61; distributions, 63-65, 68; hard drives, 68; RAM, 68; peripherals, 69; CPU, 69; drivers, 69; specification requirements, 69; desktop environments, 100, 101; embedded systems, 100, 101; servers, 100, 101
Linux, Hardware configuration, 90
Linux-Mandrake 7.1, 64
LinuxWare 2.5, 65
Logitech iFeel Mouse, 12
Logitech QuickCam Pro USB, 13
LookSmart Directory, 133
LookSmart, 113
Lycos, 113, 133

M

MAG InnoVision 810FD, 39
Master boot record (MBR), 89
Matrox Millennium G450, 41
Matt's Script Archive, 141
Maxtor DiamondMax VL 40 40.9GB, 29
MBR. *See master boot record.*
MDR-NC5, Sony, 8
Med Explorer, 115
Meta tags, 104, 105, 135, 136, 137
MetaCrawler, 120
Metasearch sites, 111
Metasearch, 120-121; sites 111; tools, 130, 131
MFD. *See multifunction device.*
Micro Solutions Backpack cd-rewriter 192100, 25
Microsoft IntelliMouse Explorer, 12
Microsoft Internet Explorer 5.5, 108
Microsoft Network (MSN), 123
Microsoft SideWinder Precision Pro, 12
Microsoft Trackball Optical, 26
Microtek ScanMaker X6 USB, 11
MIME, 93
Minolta Dimage 2300, 36
Monitors, 19-inch, 39
Motorola Talkabout T900, 39
MpTrip, Easybuy2000, 8
MSN Search: Microsoft's Engines Drive A Powerful Search Tool, 123
MSN. *See Microsoft Network.*
Multifunction device (MFD), 45

N

NAT. *See Network Address Translation.*
NEC SuperScript 1450N, 34
NeoPlanet 5.2, 109
NETGEAR, 67
Netscape Navigator 4.08, 109
Netscape Search: Navigate Your Way Through The Web, 124
Netscape, 133
Network Address Translation, (NAT), 86
News & Media, 98
Newsgroups, 98
Northern Light, 113
Notebook Backpack, Targus, 9
Notebook computers, 22, 27, 35,36, 38, 42, 43, 44, 48

O

Olympus Camedia P-400, 37
Olympus D-490 Zoom, 25
Open Directory, 133
Open source code, 68
Open source technology, 58
Opera 4.02, 110
Operating system, 68, 69, 80, 81
Organizers, 7
OS. *See operating system.*
OZ-730PC, PC, 7

P

Packages, 88
Palm device, 21
Palm m100, 26
Partition Commander, 93
PCI. *See Peripheral Component Interconnect.*
PDA. *See personal digital assistant.*
PDA/Handhelds, 19, 21, 26, 34
Peripheral Component Interconnect (PCI), 30
Personal digital assistant (PDA), 34

Personal web sites, 136, 137
Phonex Broadband Wireless Modem Jack, 17
Plug And Play Linux, 65
Point-to-Point Protocol, (PPP), 84
Portable Keyboard, Palm Computing, 7
PPP. *See Point-to-Point Protocol.*
Preparing Your PC For Linux: The OS Scales Well But You May Need To Upgrade Components, 68-69
Printers, 19, 23, 24, 29, 31, 33, 34, 36, 37, 47
Progressive Systems, 67
Proximity searching (web), 106

R

Radeon Steps Into The Graphics Card Ring, 40
Raging Search: This Search Engine Is All The Rage, 127
Red Hat Linux 7.0, 56, 58, 65, 70, 74, 76-79, 82-83; 88-91; troubleshooting, 78; hard drive; security, 82; manage files, 83; system configurations, 83 partitions, 79
Red Hat Network Monitor, (RHNM), 85
Red Hat Package Manager (RPM), 61
Red Hat Support, 91
Reference, 99
Reviews
REX 5001, Xircom, 7
RHNM. *See Red Hat Network Monitor.*
Root, 62
RPM Package Manager (RPMS), 88
RPM. *See Red Hat Package Manager.*
RxList, 115

S

S3 Diamond Multimedia Viper II, 24
Samba, 62
Samsung ML-4500, 23
Scanners, 10, 11, 23
SCSI. *See Small Computer System Interface.*
Seagate Cheetah 36LP, 31
Search directory, 106
Search engine portals, 114-117
Search engines, 104-106, 118-121, 125, 126, 128, 132-133, 136, 137
Search tool, 123
Searchenginewatch.com, 134
Searching The Web With The Top Four Browsers: Tips For Getting The Most Out Of Each Search, 108-110
Security, 99
Si2 750, WinBook, 22
Slackware 7.1, 65
Small Computer System Interface, (SCSI), 49
Smart Cat, Cirque, 7
Software, web-search, 130, 131
SonicWALL, 67
Sonigistix Monsoon MH-500, 13
Sony CLIE PEG-S300, 21
Sony ICD-37, 8
Soudah, Tasha, 119
Sound & Vision, 24, 32, 39, 40, 41, 43
Sound cards, 32
Souped-Up Searches: Find What You Need Faster, 118-121
Source code, 68
Spamdexing, 104
Speakers, 13
Specialized Search Engines: Delve Deeper Into The Web, 114-117
Spiders, 103, 104, 132
Stampedeversion 0.90, 65
Storage, 11, 25, 29, 31
Surf Monkey, 116
SuSE Linux 7.0, 65
Synchronous communication, 53

T

T54H 15.1-inch TFT LCD Monitor, 40
Talkabout T289, Motorola, 8
Tap archiver (tar), 62
TCP/IP. *See Transmission Control Protocol/ Internet Protocol.*
Telephone Call-In-Control, 17
The Calm Before The Storm: Preparation Is The Key Element Of Installing Red Hat 7.0, 74-75
The Doctor Page, 115
The Future Of Linux: Three Markets Hold The Key To Tomorrow, 100-101
The Indrema L600, 67
The Language Of Linux: Learn How To Talk The Talk, 60-62
The Linux Network: Sharing A Dial-Up Connection To The Internet, 84-87
The Main Search Engines: All The Portals That You Can't Leave Behind, 111-113
Tips For Effectively Searching The Web, 102
Torvalds, Linus, 57-59, 77-79
Toshiba Satellite 1675CDS, 42
Toshiba Satellite 2775XDVD, 35
Transmission Control Protocol/ Internet Protocol, (TCP/IP), 84
Troubleshoot Your Linux System: Expert Advice To Solve Your Problems, 88-91
Troubleshooting, 97
TWE-106B European translator, Franklin, 9
Two-way pagers, 39

U

UMAX Astra 3400, 11
UMAX AstraNET e3420, 23
Universal Resource Locator (URL), 132
Universal Serial Bus (USB), 89
Upgrading Issues: Answers To Common Installation Questions, 70-73
URL. *See Universal Resource Locator.*
USB. *See Universal Serial Bus.*
User, Meet Linux: Getting To Know The Other Operating System, 56-59
Uuencode, 93

V

Versa VXi 600, NEC, 27
Vesta Fun PCVC665K, 33
Vets.com, 117
Vim (VI Improved), 62
Voyetra Turtle Beach Santa Cruz, 32
VTech Phusion, 34

W

Wacom Graphire, 28
WatchGuard Technologies, 67
Web cameras, 8-9, 13, 21, 28, 45
Web directories, 134
Web Kangaroo, 117
Web search, 103-106, 123, 125, 126, 128, 130, 131
Web-Search Software: Powerful Programs Simplify The Information Hunt, 130-131
What You Need To Work & Play On Your Linux System, 92-95
WinBook Si 800, 44
Wine (Windows emulation), 59, 62
Wireless Mail Alert, 18
World Wide Web, 103-106; organization, 103-106; indexing pages, 104-106
WOW Thing, SRS Labs, 8

X

X Windows, 62
Xerox DocuPrint M760, 31
Xerox WorkCentre XD125f, 45

Y

Yahoo!, 113, 133
Yahoo!: Use This Web Directory To Energize Your Search, 122
Yahooligans!, 117
Yap Headset, 17
Yap Phone, 16
Your Dictionary, 116
Your Linux: Find The Distribution Flavor That's Right For You, 63-65

Z

Zeeks.com, 116

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